CAPTURING THE ROLE OF FEEDBACK: GOAL ORIENTATION, FEEDBACK SEEKING, AND SELF-REGULATION IN A LEARNER CONTROLLED ENVIRONMENT

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ABSTRACT

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The past twenty years have seen great changes in the nature of work, which has increased the demands placed on employees that require them to be increasingly specialized and adaptive to new situations. While the trend towards learner-controlled training is very popular, turning towards more fundamental principles of learning is helpful to understand the cognitive, behavioral, and affective processes individuals encounter during learning. Specifically, the current study examined the effects of self-regulation on goal orientation and feedback seeking. Four dimensions of feedback were examined in relation to manipulated goal and achievement orientation, self-regulatory processes, and learning and performance outcomes. Results demonstrated that the mastery and performance goal manipulation did influence learner choices in the amount of strategic, incorrect, self-referenced, and process feedback sought, self-efficacy, perceived goal progress, off task thoughts, frustration, basic performance, strategic performance, and generalization performance, yet few effects were observed for the approach and avoidance motivational manipulation on these same outcomes. Supplementary analyses demonstrated that the effect of the mastery-performance goal manipulation on several self-regulatory processes and outcomes was mediated by content of feedback sought. Implications of these findings are discussed as are future directions for research.

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INTRODUCTION

The past twenty years have seen great changes in the nature of work, whether increased diversity in the workforce, new methods of delivering organizational education, or increased cognitive demands placed on employees that require them to be increasingly specialized and adaptive to new situations. Because organizations are trying to do more work in less time, one outcome of organizational demands on employees is that training has shifted from being primarily an organizational task to an individual effort. Training has subsequently become more learner focused and directed, as a result of the increased responsibility that has been placed on the individual learner to control his or her training environment (Goldstein & Ford, 2002; Kozlowski & Bell, 2003). Advances in training have improved the delivery of training to learners in a variety of ways, namely via new technology. Despite the popularity of such things as e-learning, online training courses, and virtual classrooms, research on learner control provides a limited understanding of what causes learners to make the choices they do in an open learning environment (Tennyson, Tennyson, & Rothen, 1980; Brown, 2001; Ford, Smith, Weissbein, Gully, & Salas, 1998). The contemporary trend towards learner controlled training does not seem to be slowing, and as a result, the focus on learners should perhaps turn to more traditional theoretical perspectives in learning to understand learner motivation in a complex environment.

In a training context, learners are guided by their goals, feedback on their performance, and the self-regulatory processes prompted by these factors as they learn to perform (Kozlowski, Gully, et al., 2001; VandeWalle & Cummings, 1997). Research in self-regulation (Bandura, 1986, 1991; Locke & Latham, 1990; Latham & Locke, 1991;

Carver & Scheier, 1981, 2000; Karoly, 1993) has shown that individuals engaging in active learning focus on cognitive, affective, and behavioral standards for setting goals. Discrepancies between actual and desired states are drivers for future goal setting and action. An overall purpose of the current research is to further explore self-regulation in learning, especially given the new demands placed on learners in learner-controlled environments, with particular focus on feedback seeking.

One factor that influences the nature of goal setting and self-regulatory behavior is goal orientation. Individuals are differentially motivated based on their trait goal orientation and whether they are trying to master the task, achieve a high score, prove their competence, or avoid failure (Elliot & McGregor, 2001). Goal orientation has seen a transformation from a one-dimensional trait of individual striving to either demonstrate high ability or avoid demonstrating low ability (Nicholls, 1984; Dweck, 1986) to a four-dimensional conceptualization combining mastery and performance goals with approach and avoidance motivation (Elliot & McGregor, 2001), where not only are individuals concerned with either mastering or performing well on a task, learners are also focused on approaching positive events or avoiding undesirable events. As research in goal orientation has increased in conceptual complexity, so have a broader range of implications for individual behavior come to light. Thus, one purpose of the current research is to examine the utility of a four-dimensional conceptualization of goal orientation in a complex, learner controlled environment, and examine more carefully the relationship between state-induced goal orientation and a variety of self-regulatory process measures such as self-efficacy, metacognition, and goal progress.

Feedback also serves a useful purpose in assisting learners to make choices about future goal action. In a self-regulated learning environment, feedback is widely believed to have a positive effect on learning, motivation, and performance. In a review of feedback interventions, Kluger and DeNisi (1996) see the evaluation of and reaction to feedback-standard comparisons as a basic mechanism in behavior regulation. Feedback interventions activate learning processes when feedback indicates a change in behavior is necessary to achieve a different level of performance. Therefore, the evaluation of performance causes new performance standards to be generated and can enhance cognition and motivation, to reduce the discrepancy between actual and desired performance. In an embedded technology-based training system, it is expected that feedback will inform learner progress towards their goals and that learners will seek information that assists them in attaining their goals (Dobbins, 2002). Thus, a second purpose of the current research is to more fully investigate the link between goals and feedback in a learner-controlled environment, and more specifically to examine the content of feedback that self-regulating learners seek.

Given that the emphasis in current training design is to give the learner control over their course of study, I will look at the kinds of feedback people seek, examine the state-based goal components of their behavior, and attempt to gain a better understanding of the effects of learner-sought feedback on learning and performance. More specifically, I hope to show that the content of feedback sought mediates the relationship between goal orientation and self-regulatory processes and learning and performance outcomes. In the current study I will be manipulating individuals' state goal orientation and examining the relationship between goal orientation and feedback content sought, goal orientation and

self-regulatory processes, and goal orientation and learning and performance outcomes under the framework of self-regulation. I expect that individuals seeking feedback that informs state-based goals are likely to show differences in performance and affective reactions to training, not only because of differences in state goal orientation but also as a result of feedback sought.

LITERATURE REVIEW

Self-Regulation and Learner Control

Self-regulation theory provides a useful framework for understanding the general relationship between learning and task performance. This framework represents an overarching heuristic for a perspective on how individuals respond in a learning environment and acquire knowledge and skills. Although there are several models of self-regulation, all focus upon the idea that individuals regulate their attention and effort around goals that are either self-set or influenced by the environment (Kozlowski & DeShon, in press). In a review of self-regulatory theories, Karoly (1993) emphasized the social cognitive (Bandura, 1986, 1991) and goal setting (Locke & Latham, 1990; Latham & Locke, 1991) perspectives that have driven research on goal setting and self-regulatory processes. Drawing on control theory, the perspective of Carver and Scheier (1981) is also relevant to understanding self-regulation. Knowledge of goals and performance in a self-regulated learning environment has been explored from these multiple perspectives; in reviewing these theories, it is the commonality across the paradigms that provide a strong framework for understanding the relevance of goals and feedback in a self-regulated learning environment. The essence of these three theories describes the relationship between cognitive, behavioral, and affective elements in regulating the behavior of individuals during skill acquisition and learning. The sections below explain the basic tenets of these perspectives and their relationship to goal setting, learning, and task performance.

Social cognitive theory. Social cognitive theory describes goal directed behavior as regulated through three functions – self-observation, judgment of behavior in relation

to internal and external standards, and affective self-reaction (Bandura, 1986, 1991). In a learning environment, individuals use these three functions to monitor their behavior and adjust their goals to achieve their desired level of performance throughout training (Bandura, 1989). Specifically in a skill acquisition setting, individuals can also use feedback from their performance to assist them in self-appraisal and further goal striving (Bandura, 1989). Therefore, individuals are able to think about their performance, use feedback to compare their level of performance and desired level of goal achievement, and make adjustments to their goals as needed under a social cognitive perspective to self-regulation.

Goal setting theory. Locke and Latham (1990; Latham & Locke, 1991) propose that goals affect performance via their content in specificity and difficulty as well as intensity, or how committed people are to their goals. Feedback provides information to the learner, which informs learners if they are accomplishing their goals. If the standard of performance is achieved, feedback can lead to the setting of and commitment to even more specific, difficult goals. However, if the standard of performance is not being met, feedback can assist the learner in planning, revising strategies, and setting goals that are more appropriate to improve upon past performance. Therefore, goal setting is directly linked to knowledge of performance, which places high value and utility on feedback to assist future goal striving.

Control theory. Carver and Scheier (1981) use the idea of discrepancy reduction to categorize behavior in a self-regulation context. In a learning environment, goals and feedback serve a cybernetic function (Weiner, 1948) that informs progress on skill acquisition and generates future actions, which attempt to reduce the discrepancy

between actual performance and desired performance as stated by the learners' goals. Learners compare their progress, based on feedback, to their desired level of performance and make adjustments to their behavior, which is intended to reduce the discrepancy between levels of performance. Therefore, feedback again has high utility to the learner as it assists the individual in controlling the variability between actual and desired performance.

Integration. These three perspectives all describe an environment where goals and feedback are useful information that can be used to structure learning and assist in future goal setting to change current performance. While much time could be spent on analyzing the differences across these perspectives, it is the present goal to build upon the basic similarities across these paradigms, which is of benefit to understanding learner control in a self-regulated learning environment. Self-regulation provides a framework for understanding the relevance of goals and feedback in a learning environment and how learner choices and progress on a task can be influenced by knowledge of goal achievement. The following sections explain the function of self-regulation more specifically in a learning environment.

Self-Regulation in Learning

Self-regulation in learning is defined as a process whereby learners set goals for a given task, use various strategies to meet those goals, and monitor their activities to assess their progress towards those goals (Butler & Winne, 1995). Typically, the process of self-regulation is seen in four phases of learner (1) forethought, planning, and activation, (2) monitoring behavior, (3) controlling behavior, and (4) reaction and reflection on performance (Pintrich, 2000; Kozlowski, Gully, et al., 2001). In general,

models of learning in a self-regulated context assume that learners are active, constructive participants in the learning process and that learners can potentially monitor, control, and regulate certain aspects of their own cognition, motivation, and behavior (Pintrich, 2000). Models of self-regulation also assume there is some type of criterion or standard (goals or reference values) against which performance comparisons are made in order for learners to assess whether they should continue pursuing the same goals, or set new, different goals (Pintrich, 2000). Specifically, research has shown that self-regulatory activities include strategies for learners to plan, monitor, and modify their own cognition (e.g., Brown, Bransford, Campione, & Ferrara, 1983; Corno, 1986; Zimmerman & Pons, 1986, 1988), manage and control their effort (Corno, 1986; Corno & Rohrkemper, 1985), as well as cognitive strategies for learning, remembering, and understanding material (Corno & Mandinach, 1983; Zimmerman & Pons, 1986, 1988).

Although research has shown that these strategies are essential for self-regulation, simple knowledge of the existence of cognitive and motivational strategies in self-regulation is not enough for self-regulatory behavior to occur. Students must also be motivated to use the strategies as well as regulate their cognition and effort (Paris, Lipson, & Wixson, 1983; Pintrich, 1988, 1989; Pintrich, Cross, Kozma, & McKeachie, 1986). In understanding self-regulatory behavior by students, realizing students' perceptions of the learning environment as well as individual motivational orientations and beliefs about learning are relevant to actual cognitive engagement and learning performance (e.g., Ames & Archer, 1988; Nolen, 1988). In general, self-regulatory learners are characterized by displaying initiative (Schunk, 1990), persistence (Pintrich &

De Groot, 1990; Schunk, 1990; Zimmerman, 1986), and effort (Pintrich & De Groot, 1990).

In an environment where the opportunity exists to monitor complex learning relationships, self-regulation in learning provides a comprehensive framework for understanding ideally how learners can make choices regarding their own learning progress, given their desire to persist on learning tasks and display initiative and effort. However, as pointed out, the learner must be motivated to utilize these strategies (Pintrich & De Groot, 1990). Research on actual choices of learners is not as optimistic regarding their motivation and choices in learner-controlled environments.

Learner Control in Self-Regulated Learning

Learner control is defined as learner decisions regarding the level and focus of effort exerted during a learning opportunity (Brown, 2001; Bell & Kozlowski, 2002a). Learner choices are reflected in both behavior, or what the learner does in the system, and cognition, or what the learner thinks about while in the system. According to self-regulation in learning, although learner control may have motivational advantages by giving learners more choices over what material they learn, in what order, and how much time they spend on material, research has shown that individuals do not manage their learning well. In a review of computer-based instruction, Steinberg (1977) found that many students made poor choices deciding what material to spend time learning, especially those performers who were not doing well during the learning session. Although research has shown that learners who practice essential elements of a task more than others gain more skills and knowledge, (Goldstein, 1993; Thorndike, 1913), and that learners who spend more time practicing learn more than those who spend less time

practicing (Ericsson, Krampe, & Tesch-Romer, 1993; Simon & Chase, 1973), actual results from students trying to employ these techniques are not very promising. Steinberg (1989) and Tennyson (1980) found that many students given control over their learning choose to terminate the experience before mastering the task. In addition, the self-guided exploration of new learners typically results in poor search strategies on electronic tasks such that novice searchers are unable to accurately judge their progress or the adequacy of their responses (Debowski, Wood, & Bandura, 2001). However, because research on the occurrence of learner-controlled training programs is still somewhat novel, there is still much to understand about learner choices regarding practice time and time on task (Martocchio, 1994; Tannenbaum, Mathieu, Salas, & Cannon-Bowers, 1991).

While research on actual learner choices is somewhat discouraging, from an affective perspective, research has shown several advantages to learners in learner-controlled environments. Bandura (1997) found that a positive sense of efficacy results from an individual exercising control over a situation such that the learner's efficacy may increase by engaging in learner controlled training. Reciprocally, when considering self-regulation, learner efficacy may also have a positive influence on learning behaviors that are under the learner's control (Milheim & Martin, 1991). Realizing the positive effects on efficacy, as well as the potential effects onunderstudied constructs related to learning, researchers may be able to take advantage of technological advances in training delivery methods that place more control in the learner's hands. In utilizing virtual training and global training operations to more efficiently deliver training, those responsible for designing and implementing these training programs would be best served by

understanding research in self-regulation as well as the newly developing knowledge in the advantages and disadvantages found in learner controlled environments.

As goals and feedback are central components in the self-regulatory process, likewise are goals and feedback assumed to assist learners in making smarter decisions in a self-regulating learning environment. Goals have been found to direct action, sustain effort, and enhance long-term performance and motivation (Bandura, 1982; Carver & Scheier, 1982; Spivack, Platt, & Shure, 1976). More specifically, differences in individual goals classified under a goal orientation framework have also been found to predict behavior and the cognition of learners, which together serve as subsequent predictors of actual learning (Ford et al., 1998; Pintrich & De Groot, 1990). The next section will explain goal orientation in much more detail, but in general, some learners are thought to benefit more in a learning environment because of a focus on using practice opportunities as learning opportunities to examine and practice the material, compared to other learners who see practice opportunities as a way to monitor their progress and focus attention on performance levels, rather than focusing more carefully on the material to be learned (Brown, 2001). Finally, when feedback is available, it helps learners in guiding their exploration, can motivate task focus, and gives the learner the opportunity to make comparisons between his performance and a standard (Kluger & DeNisi, 1996).

This discussion has highlighted the advantages of using self-regulation as a framework for understanding learner goals, behavior, choices, and reactions in a learner-controlled environment (see Figure 1). Self-regulating learners are expected to actively plan, monitor, and modify their cognition and behavior around a specific goal, and use

feedback about their performance to assist them in achieving their desired level of performance. Learners' affective reactions to their performance as well as the level of actual learning and performance are also important constructs to consider in a self-regulatory learning environment. In sum, under a self-regulatory framework, individual goals are expected to influence feedback seeking behavior, which in turn is expected to influence learners' reactions to their performance and their overall level of knowledge and performance. While individual goals, feedback, and reactions to performance have been briefly mentioned, the following section will elaborate on the nature and contribution of individual goals, feedback seeking behavior, self-regulatory process reactions, and performance outcomes to self-regulation and learning.

Goal Orientation

Goal orientation is an important construct related to learning and training. In a training context, learners will be guided by their goals, which can shape their performance (Kozlowski, Gully, et al., 2001; Dobbins, 2002). It is important to understand how individual goals are manifest in a training environment as well as several other dimensions of goal orientation as a construct. The following sections explain the importance of goal orientation in its theoretical background, dimensionality and measurement of the construct, trait-state interactions, and how self-regulation influences individual goals.

Theoretical Background

Mechanisms. Historically, goal orientation as a construct was introduced in the literature by Nicholls (1984). Nicholls discussed goals in terms of individual behavior where the goal was to either demonstrate, to the self or others, high ability, or avoid

demonstrating low ability. Adapting ideas from Kukla (1978) and McFarland and Ross (1982), Nicholls categorized individual behavior along two dimensions, ego- or task-oriented. Someone adopting an ego-orientation, which he also described as a "more differentiated" view of ability, thought of their own ability as a capacity that, in addition with task difficulty, was judged against the performance of others. Under this conceptualization, ability is thought to be rather stable. A performer who must display a great deal of effort to achieve a certain level of performance was seen as having lower ability, compared to a high ability individual who put forth little effort. Because the low ability individual has to work harder, via increased effort, to achieve the same level of performance as someone with higher ability, the low ability individual was therefore judged by others to indeed have low ability. Because of this comparison, ego-oriented individuals desire to improve their performance on tasks relative to others, rather than improving their own ability.

In contrast, someone adopting a task-orientation, which Nicholls (1984) also described as a "less differentiated" view of ability, thought of their own ability as something to be developed or practiced. Because task difficulty and ability judgments are self-referenced for task-oriented individuals, someone who judges a task to be difficult and then succeeds on that task believes they have high ability. Contrary to ego-oriented individuals, task-oriented individuals who put forth effort to achieve a difficult task believe themselves to have high ability. Task-oriented individuals will take advantage of opportunities to develop and practice their skills because demonstrating high ability and working towards improvement are their goals.

Dweck (1986) and Dweck and Leggett (1988) built on this idea, describing goals in terms of the individuals' belief in the malleability of their intelligence. Drawing on research by Atkinson (1964) on motivation and goal-oriented activity, Dweck (1986) categorized goals along two dimensions: performance and learning. People who adopt learning goals seek to increase their competence and to understand or master something new (similar to Nicholls' (1984) task-orientation). People who adopt performance goals seek to gain favorable judgments of their competence or avoid negative judgments of their incompetence (similar to Nicholls' (1984) ego-orientation). What drives the choice of goal is individual perceptions of the malleability of their ability. In several studies of school-aged children, Dweck (1986) found that children who described that their intelligence or ability were fixed attributes were likely to adopt performance goals whereas children who described their intelligence/ability as something that could be changed were likely to adopt mastery goals. These findings build upon Nicholls' (1984) research describing goal behavior for task- and ego-oriented individuals, but more specifically labels goals along performance and learning dimensions.

Dweck and Leggett (1988) further described the cognitive processes underlying the adoption of different types of goals. Some individuals favor an incremental theory of intelligence, which defines intelligence as a malleable, increasable, controllable quality. Others subscribe to an entity theory of intelligence, which sees intelligence as a fixed or uncontrollable trait. Research by Dweck, Leggett, and colleagues (Bandura & Dweck, 1985; Dweck & Bempechat, 1983; Leggett, 1985; Dweck, Tenney, & Dinces, 1982) have consistently found that individuals who believe that intelligence is increasable pursue learning goals, which allow them to increase their competence, while those who believe

intelligence is fixed pursue performance goals, which are more likely to result in positive judgments of that fixed intelligence or allow them to avoid negative judgments of low intelligence.

Reactions to difficulty also differentiate learning- and performance-oriented individuals. Dweck and Leggett (1988) found that performance-oriented children tended to attribute failures to personal inadequacies or deficiencies that led them to stay away from more difficult aspects of the task in fear that they might continue to perform poorly. In contrast, mastery-oriented children approached difficulty with a positive perspective as though difficult aspects of the task provided opportunities to solve problems and increase mastery.

Based on Nicholls (1984) and Dweck and Elliott (1983), Elliot and Harackiewicz (1996) further classified learning and performance goals. Although alluded to in prior research, earlier work on goal orientation defined performance-oriented individuals as people who sought favorable judgments of their competence or avoided negative judgments of incompetence (Dweck, 1986). Similarly ego-oriented individuals were characterized as people who wished to demonstrate success to portray high ability or avoid failure if failing would indicate low ability (Nicholls, 1984). Elliot and Harackiewicz (1996) advocated for a three-dimensional typology of goals: mastery, performance-approach, and performance-avoid. Under performance goals, the desire to gain approval and demonstrate ability (an "approach" focus) captured a different dimension than individuals whose goals were to avoid disapproval and avoid demonstrating low ability (an "avoid" focus). Combining an approach-avoid motivational focus with the construct of goal orientation was an important contribution

that advanced the conceptualization of goal orientation beyond simple performance and learning or mastery goals. Extending the concept of goal orientation into the motivational literature also has important implications for understanding the role of self-regulation in learning from an approach and avoidance perspective.[1]

These approach and avoidance strategies can be traced back through the theoretical mechanisms of goal orientation. Dweck and Elliott (1983) and Nicholls (1984) implicitly described approach strategies in both learning/task goals that focused on the development of competence and task mastery and performance/ego goals that focused on attaining positive evaluations of competence. They also implicitly describe avoidance strategies in performance/ego goals that focus on avoiding negative evaluations of incompetence. Approach and avoidance ability goals, along the task and performance domain, have also been explicitly acknowledged by Midgley and colleagues (Middleton & Midgley, 1997; Midgley et al., 1998), and mirror the implicit approach and avoidance underpinnings of Dweck (1986) and Ames (1992).

The most thorough case for the inclusion of approach and avoidance tendencies in goal orientation is provided by Elliot and colleagues (1999; Elliot & Harackiewicz, 1996; Elliot & Covington, 2001). Linked to Higgins (1987; 1997), people are motivated by positive and negative incentives and possibilities, which can be translated into the types of goals people set for themselves and the opportunities they seek out. Approach goals

[1] The author recognizes the contribution of Higgins (1987, 1997) to self-regulation in defining behavior as having either a promotion (approach positive events) or prevention (avoid negative events) focus, which translates into self-guides. Individuals with a promotion focus regulate around an ideal self-guide, whereas individuals with a prevention focus regulate around an ought self-guide (Higgins, 1987; 1997). These self-guides are usually at odds with one another; self-regulatory mechanisms attempt to reduce the discrepancy between ideal and ought self-guides (Higgins, 1987; 1997). More specifically, however, I have chosen to focus on Elliot's (1999) contribution to self-regulation in achievement motivation, but wish to recognize Higgins for his perspective nonetheless.

encourage individuals to seek out positive, desirable events whereas avoidance goals encourage individuals to avoid negative, undesirable events (Elliot, 1999). Combining approach and avoidance goals under a mastery-performance framework, Elliot and Harackiewicz (1996) citing achievement motivation theory (McClelland, 1951; Lewin, Dembo, Festinger, & Sears, 1944; Atkinson, 1957), explicitly recognize approach and avoidance strategies in their trichotomous framework of goal orientation in mastery, performance-approach, and performance-avoid orientations. Most recently, approach and avoidance strategies have been fully integrated into a theoretical typology of goal orientation (Elliot & McGregor, 2001), resulting in a four-fold classification of goal orientation and achievement motivation.

The four-fold conceptualization of goal orientation stems from research on understanding the differences between learning goals and performance goals (Dweck, 1986; Nicholls, 1984) as well as literature on achievement motivation (Elliot & Harackiewicz, 1996; Elliot & Church, 1997). Under the current conceptualization, Elliot and McGregor (2001) define goal orientation as a combination of competence and the valence of the competence that drives individuals to select particular goals. Individuals strive to either view their achievements against a normative or self-referenced standard. Similar to previous research on ego- and task-oriented individuals (Nicholls, 1984), performance (ego) oriented individuals seek to compare their performance against the performance of others, whereas mastery (task) oriented individuals seek to compare their performance against their own past performance (Elliot & McGregor, 2001). This is also consistent with Dweck and Leggett's (1988) research on learning- and performance-oriented individuals. Because they view ability as malleable, learning-oriented

individuals seek to improve upon their own past performance because they are striving to improve their ability, whereas performance-oriented individuals, who view their ability as fixed, simply want to gain favorable judgments of their own competence when compared to others.

Understanding the valence of the competence, whether someone is striving towards something that is positive (an approach tendency) or avoiding something that is negative (an avoid tendency), completes the present conceptualization of goal orientation (Elliot, 1999). This approach-avoid dimension to understanding behavioral tendencies was central to classic understanding of achievement motivation (Atkinson, 1957; Murray, 1938) but was not explicitly acknowledged until the trichotomous typology of goal orientation (Elliot & Harackiewicz, 1996; VandeWalle, 1997). As defined by Elliot (1999), behavior driven by an approach motivation is directed by a positive or desirable event while behavior driven by an avoidance motivation is directed by a negative or undesirable event. In concert with mastery- and performance-oriented goals, the dimensions of both competence and valence are central to understanding goal achievement and goal striving behavior, especially in self-regulated learning environments (Elliot & McGregor, 2001).

Implications for behavior. Although the theoretical conceptualization of goal orientation has advanced beyond that of early work in the field (e.g., Nicholls, 1984; Dweck, 1986), past research on task- and ego-orientation is still useful for understanding the implications of behavior for individuals who ascribe to either a performance- or mastery-orientation.

In accord with research on ego- and task-involvement describing conceptualization of ability, because ego-involved individuals view ability as stable, they will choose tasks they can do well at so that they can demonstrate the ability they do possess (VandeWalle, 1997) and minimize the display of effort, as having to show effort tells others that the individual has low ability (Nicholls, 1984). Likewise, task-involved individuals, because they see ability as something that can be developed through effort, will choose tasks that give them opportunities to practice, display their skills, and display effort, which translates into a display of high ability (Nicholls, 1984; VandeWalle, 1997).

Confidence in ability also drives task choice for performance- and mastery-oriented individuals. High-ability performance oriented individuals will seek tasks which give them the opportunity to show their competence and avoid the risk of errors (Dweck, 1986). Low-ability performance oriented individuals will also seek tasks which avoid the risk of errors but will also seek situations where they can avoid negative judgments of their incompetence. Therefore, they will select tasks that are either very easy where the possibility of being successful is very high, or very difficult tasks where there would be no expectation from others for the individual to do well (Dweck, 1986). Mastery-oriented individuals, regardless of their confidence in ability, will seek out challenging opportunities that foster learning because their goal is to increase their competence (Dweck, 1986). Compared to performance-oriented individuals, mastery-oriented individuals also display more problem-solving strategies when faced with failure and seem to react more positively when faced with challenges (Dweck & Leggett, 1988).

Perseverance in the face of failure is a common characteristic of mastery-oriented individuals. Not only will mastery-oriented individuals seek out challenges because they

want to display their effort and ability, mastery individuals also adopt an adaptive response pattern when faced with failure as though failing provides them with useful feedback to improve their performance in the future (Button, Mathieu, & Zajac, 1996). Conversely, performance-oriented individuals will tend to avoid challenges because they fear a display of low ability and will often adopt a "helpless" response pattern and withdraw from activities that they cannot perform (Button et al., 1996).

When considering goal orientation from a competence by valence perspective, implications for behavior are four-fold. Consistent with previous research (e.g., Dweck, 1986; Nicholls, 1984; VandeWalle, 1997; Elliot, 1999) mastery-oriented individuals seek tasks where they can display ability relative to their own past performance and performance-oriented individuals seek tasks where they can display ability relative to others. Approach-oriented individuals seek tasks where they can be successful and avoid-oriented individuals seek tasks where they can avoid failure. Combined, mastery-approach individuals will seek opportunities for success relative to their past performance and mastery-avoid individuals will seek opportunities to avoid failure relative to their past performance (Elliot & McGregor, 2001). Performance-approach individuals will seek opportunities for success relative to others and performance-avoid individuals will seek opportunities to avoid failure relative to others (Elliot & McGregor, 2001).

Evaluation of performance and ability. In general, mastery-oriented individuals judge their performance against their own past efforts while performance-oriented individuals judge their performance against the performance of others. For example, ego-involved individuals are concerned with displaying their ability to others and when made more self-aware, ego-involved performers will pay higher attention to social comparison

norms to be sure that their ability is being highly rated compared to others (Nicholls, 1984). In contrast, task-oriented individuals see mastery of a task as their desired end state and are interested in how repeated demonstration of their own effort maximizes their own perceived ability (Nicholls, 1984). Along similar lines, satisfaction with outcomes is driven by the display of ability for people who adopt performance goals and the display of effort for people who adopt mastery goals (Dweck, 1986).

Understanding the amount of control one has over an outcome also provides insight into the differences between mastery- and performance-oriented individuals in evaluation of performance and ability. For performance-oriented individuals, ability is gauged by comparing the individual's level of performance to the performance of others. Those who perform well will therefore believe that they have high levels of ability and therefore judge the outcomes to be more controllable, compared to low performers who view their ability to be low and therefore feel they have low control over outcomes (Button et al., 1996). For mastery-oriented individuals, because they feel that their ability and skills can influence outcomes via their own effort, they will experience a greater sense of control over outcomes (Button et al., 1996).

Finally, as previously mentioned, when evaluating competence, mastery-oriented individuals will compare their performance to an intrapersonal or self-referenced standard while performance-oriented individuals will compare their performance to a normative standard (Elliot & McGregor, 2001).

Dimensionality and Measurement

While the dimensionality of the construct of goal orientation has been alluded to in the previous section, often times in the literature this dimensionality has not been

explicit. For example, Dweck's (1986; Dweck & Leggett, 1988) conceptualization of ability, whether fixed or malleable, is assumed to be along one continuum, as is Nicholls' (1984) conceptualization of ego- vs. task-orientation as the differentiated view of ability, whether more or less, on one continuum. In both cases, whether someone believes in the differentiated view of ability, or that their ability is either fixed or malleable, the conceptualization of ability drives goal choices.

Using confirmatory factor analysis, Button et al. (1996) provided support for goal orientation as a two-dimensional construct. In a series of four studies, using a sample of undergraduate students, Button et al. (1996) identified mastery and performance orientations as two conceptually and empirically distinct dimensions as well as established construct and discriminant validity for their two-dimensional goal orientation measure.

Goal orientation has also been conceptualized and measured as a three-dimensional construct. Although conceptualizing ability as either fixed or malleable, Dweck (1986; Dweck & Elliot, 1983; Nicholls & Dweck, 1979) describes three categories of goals (although does not explicitly acknowledge a separation of performance goals into approach-avoid focus): learning goals which encourage individuals to increase their competence, performance goals which encourage individuals to gain favorable judgments of their competence, or performance goals which encourage individuals to avoid negative judgments of their incompetence. Nicholls (1984) also describes ego- and task-involved goals along three dimensions but does not explicitly separate ego-involved goals (desire to demonstrate ability through success or avoid demonstrating low ability through failure) into two distinct sets of goals.

Elliot and Harackiewicz (1996) do conceptually separate goals into three dimensions – mastery, performance-approach, and performance-avoid – providing theoretical support from classical conceptualizations of achievement motivation (Atkinson, 1957; Lewin et al., 1944; McClelland, 1951) and empirical support from an experimental manipulation of goals as justification for this trichotomous framework. VandeWalle (1997) also created a three-way typology of goals and an instrument to measure goals along this framework. Citing Elliot and Harackiewicz (1996) and Nicholls (1989) for conceptual support, VandeWalle (1997) identified mastery, performance-approach, and performance-avoid goals as three conceptually and empirically distinct dimensions. This measure was designed for specific use in a work domain, as compared to the measure by Button et al. (1996), which was more global in measuring learning and performance orientations. VandeWalle (1997) highlighted the domain specificity as a strength of the measure, as individuals could potentially hold different goal orientations in different domains (e.g., academic, work, athletic). VandeWalle also points out that including contextually referenced items was consistent with Ajzen's (1987) recommendation for increased construct specificity.

The Elliot and McGregor (2001) four-way conceptualization of goal orientation – mastery-approach, mastery-avoid, performance-approach, and performance-avoid – has also engendered a four-dimensional measure. Using a sample of undergraduate students, Elliot and McGregor (2001) established through exploratory and confirmatory factor analysis four distinct categories of goals. Specifically, the departure of the four-way typology of goals from previous frameworks includes a mastery-avoid goal, which is grounded in fear of failure, low self-determination, low perceived classroom engagement,

entity theory, and competence valuation (Elliot & McGregor, 2001). An example of a mastery-avoid focused individual is a perfectionist who strives to avoid making any mistakes or doing anything wrong or incorrect (see also Flett, Hewitt, Blankenstein, & Gray, 1998; Pintrich, 2000). Although the conceptual foundation for the four-fold classification of goal orientation is well developed, the value of this classification to understanding self-regulation is relatively unexplored to date.

Trait and State Orientations

Another important issue around goal orientation is whether an individual's goal orientation is a stable trait, a situationally induced state, or both. The distinction between trait and state is an important one both for conceptual understanding and research design: if an individual can have both a trait and state orientation, acknowledging the interplay between the trait and state can have important implications on outcomes. The literature has presented evidence for goal orientation as a trait, a state, and an interaction of trait by state, thereby suggesting that all three perspectives merit attention.

Advocates of a trait approach to goal orientation view goal orientation as a relatively stable dispositional variable (e.g., Colquitt & Simmering, 1998), and when measuring goal orientation, treat the construct as a stable trait that varies between individuals (VandeWalle, 1997; VandeWalle & Cummings, 1997; Fisher & Ford, 1998).

Proponents of a state approach to goal orientation include Ames and Archer (1988) who described achievement goals that differed as a function of situational demands, where these demands, such as an emphasis on social comparison or self-improvement, can affect the direction of an individual's actions. Individuals can focus on ability (performance-oriented) or focus on effort and task strategies (mastery-oriented),

respectively. Kraiger, Ford, and Salas (1993) have also identified goal orientation as a motivational state that can be adaptable in training interventions.

Research has also presented a perspective that acknowledges goal orientation as both a trait and state. Theoretically, Dweck (1986) discussed goals in terms of tendencies, which would represent a trait perspective, but also discussed motivational interventions on behavior in a classroom setting, such as teacher expectancies and methods for retraining children's attributions for failure, and the effect on short-term goal orientation, which would represent a state perspective. Likewise, Button et al. (1996) see goal orientation as both a trait and state. Traits will dispose individuals to adopt response patterns to situations that can also be influenced by characteristics of the situation, resulting in a state orientation that may be different from the individual's trait orientation. They provide support for this in the final study of their 4-study series on the measurement of goal orientation (Button et al., 1996). In analyzing a model including both mastery and performance states and traits, Button et al. (1996) found that a four-factor model including performance goals, learning goals, situational performance goals, and situational learning goals fit better than a two-factor model solely of learning goals and performance goals, providing support that the situational and trait-like aspects of goal orientation are able to be distinguished. A study by Boyle and Klimoski (1995) also found evidence for differences in state and trait orientation. After manipulating goal orientation via either a successful (learning-oriented) or unsuccessful (performance-oriented) encounter with a biology tutorial, the authors found evidence of two uncorrelated factors for both learning orientation and performance orientation, along trait and state dimensions.

The differences presented in the literature for what constitutes an "appropriate" way to measure goal orientation, whether as a trait or a state, has left the question unanswered, with neither a correct nor incorrect perspective having been offered to date. The inconsistent application of goal orientation in research, as both a trait and state, is evidence for continuing research from all perspectives towards a greater understanding of the relationship between goal orientation and related outcomes.

To summarize, research on goal orientation has laid a foundation for its conceptualization as a four-dimensional construct with roots in traditional goal orientation research as well as in achievement motivation. The link to achievement motivation also frames goal orientation in a self-regulatory perspective and provides support for its inclusion as a worthwhile construct to study in self-regulated learning environments. As described earlier, knowledge of goal orientation is only one key construct in the relationship between goals and performance outcomes; knowledge of performance, or feedback, also serves a central role in self-regulation. The next section will explain the importance of feedback in self-regulated learning.

Feedback in Self-Regulation

Effects of Feedback on Performance

Feedback is a critical aspect of self-regulated learning and is widely believed to have a positive effect on learning, motivation, and performance. Ammons (1956) found that knowledge of performance increased learning and motivation, and affected the rate of learning and level reached by learning. However, other research has found very small (Harris & Rosenthal, 1985) to no effects (Locke, 1967; Locke & Bryan, 1969) for feedback on performance. Kluger and DeNisi (1996) also dispute Ammons' findings,

indicating that feedback has been shown to have positive, negative, and null effects. In a review of feedback interventions, Kluger and DeNisi (1996) see the evaluation of and reaction to feedback-standard comparisons as a basic mechanism in behavior regulation. Feedback interventions activate learning processes when feedback indicates a change in behavior is necessary to achieve a different level of performance. Therefore, the evaluation of performance causes new performance standards to be generated and can enhance cognition and motivation, to reduce the discrepancy between actual and desired performance. In reducing the discrepancy and evaluating feedback on actual and desired performance, the resulting change in performance could be in positive, negative, or no direction. Therefore, research can make advances in coming to a clearer understanding of what conditions are best suited for positive performance changes following feedback interventions. In addition, greater knowledge can be gained regarding which individual differences increase learning and show greater allocation of resources towards learning.

Kluger and DeNisi (1996) do indicate, based on locus of attention, that knowledge of task- and ego-focus link directly to goal orientation and provide additional insight on the allocation of cognitive resources. Thus, this links feedback interventions to individual differences that may have differential implications for the utility of feedback in general on performance. For ego-oriented individuals, seeking feedback would take away resources from concentration on the task and shift focus to themselves. If ego-focused (performance) individuals are preoccupied with themselves, then the likely benefit of learning about their performance on the task is lost. Task-oriented (mastery) individuals are more able to maintain concentration on the task after receiving feedback and therefore benefit more from seeking feedback. Identifying these individual

differences characteristics that relate to the effects of feedback create a richer picture of the conditions where positive changes in performance are possible.

Most past research considers feedback as a given and has not considered it (presence/absence or type) to be variable (e.g., Ashford & Cummings, 1983). Kluger and DeNisi (1996) imply that feedback is a choice activity and that the decision to choose feedback, and more specifically the content of what is chosen, depends on a variety of factors. Research addressing the aspects of feedback choice has been two fold in context: (1) evaluating the social cost and benefit of seeking feedback in work environments, and (2) the cost and value of feedback in learning environments.

Feedback Choice

Work environment. Some past research has emphasized feedback seeking and choices in an open, social environment and has focused on the cost and value people in general associate with seeking feedback (Ashford & Cummings, 1983). Feedback can (a) reduce uncertainty in the environment, (b) signal individuals about the relative importance of goals, (c) be an indicator of competence, (d) raise ego awareness, and (e) act as a cybernetic mechanism, providing information about the actual performance or actions of a system which is used to control future actions of a system (Weiner, 1948). Although this perspective is broader than the self-regulatory framework presented earlier, there is considerable overlap, in that feedback, from a self-regulatory perspective, indicates competence, raises ego awareness, and acts as a regulatory mechanism.

In their model, Ashford and Cummings (1983) provide several methods by which individuals gain feedback from their work environment such as monitoring the situation, observing the reaction of others to their own behavior, and comparing their behavior to

others for cues useful as feedback. Individuals can also ask others for their perception and evaluation of the individual's behavior. The relative amount of effort required to gain this information also factors into whether or not the individual will seek out the information in an open learning environment. The benefits of the feedback sought are also relevant to understanding when someone will engage in feedback monitoring behavior. The value of feedback, or the degree to which feedback is seen as a personal resource for the individual, will also factor into the individual's decision to seek feedback (Ashford & Cummings, 1983). Because feedback is an indicator of competence, reduces uncertainty, and signals individuals to the importance of various goals in an environment, feedback can serve an important function to individual learners as a resource for knowledge about their performance (Ashford & Cummings, 1983).

The perspective of Ashford and Cummings (1983) describes a work environment that is performance oriented and requires individuals to be very aware of the social costs of seeking feedback. Because all feedback comes from either asking others or looking inwards to observe and/or monitor behavior, feedback seeking can be seen to be a function of high impression management and high social cost. Although this represents an important perspective on learning in the work environment – it has been mostly applied to newcomer socialization in processing social cues (e.g., Black & Ashford, 1995; Ashford & Black, 1996). This perspective does not inform choices regarding learner control, self-regulation in a complex environment, nor technology-based training devoid of impression management and social costs. In a technology-based training environment, individual choices are unknown to others; therefore, any feedback sought

must be because of internal reasons, such as individual learner goals, because external influences are eliminated.

The model developed by Ashford and Cummings (1983) on feedback seeking also does not provide much detail on the cognitive complexity of the situation or type of behavior for which feedback is being sought, another reason why the current study is a departure from this line of work. Their model explains feedback in organizations with vague references to achieving valued goals of the organization, whereas the current study focus is on feedback relative to very explicit, cognitively demanding situations where the learning demands on the individuals are expected to be much higher than the type of situations discussed by Ashford and Cummings (1983).

Ashford and Cummings (1983) also do not differentiate individuals on source of motivation to seek feedback. Because of differential influences of individual goals and motivation on behavior, it is unlikely that all people make choices about and utilize feedback in a uniform manner. To advance understanding, it will be useful to categorize individuals based on individual differences that may affect their feedback-seeking behavior in a more learning-focused environment.

Learning environment. VandeWalle and Cummings (1997) use a more cognitively complex environment, a college accounting class, to assess feedback-seeking behavior. They focus on the costs of seeking feedback, along the same lines as Ashford and Cummings (1983), but they place greater emphasis on the utility and value that different types of individuals find in seeking feedback. For example, learning goal-oriented individuals believe ability can be developed and are willing to exert effort to develop ability. They view feedback as diagnostic information about how to improve

performance. Therefore, learning individuals should see the developmental value of feedback. Feedback has a high expectancy value because learning goal individuals believe that feedback sought will be useful for improving performance and developing ability. Performance goal-oriented individuals believe ability is fixed and uncontrollable. They believe exerting effort is a display of low ability. They will adopt a maladaptive pattern of behavior where they withdraw from the task and choose not to seek feedback, which is consistent with withdrawal. Feedback has a low expectancy value because performance goal individuals believe that their ability is fixed and information on how to improve performance is of little use.

For the purposes of the current study, the cost of feedback seeking (Ashford & Cummings, 1983; VandeWalle & Cummings, 1997) is irrelevant. Previous studies have examined feedback in a social environment where individuals must weigh the social cost and benefit of feedback seeking behavior. In a technology-based environment, feedback is not sought from a social source such as a supervisor; it is sought from a computer. Individual choices are also unknown to others; therefore, any feedback they seek must be because of internal reasons.

Goal Orientation, Feedback, and Self-Regulatory Processes

VandeWalle, Cron, and Slocum (2001) describe three key advantages of using goal orientation as a lens by which to understand the function of feedback. As individuals attempt to achieve, attain, or accomplish goals (Locke & Latham, 1990), feedback serves as an indicator of performance and assists learners in effective self-regulation (Dweck & Leggett, 1988) by providing veritable information on their goal progress. From the learner's perspective, goal orientation influences interpretation of the

purpose of feedback such that a learning goal orientation leads people to view feedback as diagnostic for correcting errors and developing task mastery, whereas a performance goal orientation leads people to view feedback as judgmental about the self (Bobko & Colella, 1994; Farr, 1993; Kanfer, 1990). Goal orientation also influences the saliency of different performance aspects and increases sensitivity to either successful aspects of past performance or failure-relevant information (Farr, Hoffman, & Ringenbach, 1993). Based on locus of attention, task- vs. ego-focus provides additional insight into allocation of cognitive resources (Kluger & DeNisi, 1996). Because differences in goal orientation affect the interpretation and saliency of feedback information, as well as allocation of resources, it is likely that learners will react differently to varying kinds of feedback and will seek feedback that assists their individual goal achievement. Likewise, it is also expected that different information contained in specific content dimensions of feedback, along with the ability to choose which feedback to view, are likely to result in differences in learners' cognitive, behavioral, and affective reactions to their learning and performance. As such, the following section outlines four dimensions of feedback that are expected to be relevant in goal striving environments.

Feedback Dimensions

While there is a dearth of research identifying the key content factors of feedback that are most relevant given the nature and quality of self-regulation instigated by different goal orientations, theory and research in goal orientation discussed previously provides a basis for positing the types of feedback characteristics or dimensions that are likely to be attractive or consistent with different goal orientation types. For example, research has shown that differences exist in learners' preferred point of reference for

gaining information on their ability such that performance-oriented learners are interested in judgments about their ability and performance relative to others, while mastery-oriented learners are concerned with their own self-improvement (Nicholls, 1984). Therefore, feedback that differs in its point of reference, or whether it provides normative or self-referenced information, is likely to be differentially valued and sought by performance- and mastery-oriented learners, respectively. Point of reference is only one dimension of feedback that is relevant to goal orientation and self-regulation; three additional dimensions that are related to differences in learners' goals are providing process versus outcome results, making available feedback of either a positive or negative sign, and presenting feedback information along varying depths, or complexity, of information content. While the relationship between point of reference and goal orientation has been briefly discussed above, the relationship between all four dimensions and goal orientation is described in more detail in the following sections.

Knowledge of Results

Feedback can assist in the maintenance of intrinsic motivation and task involvement by providing individualized information relevant to performance goals and standards for self-evaluation (Bandura & Cervone, 1983). From Butler (1987), the effect of feedback on task interest will depend both on the degree to which feedback is perceived to be a source of control over behavior and the degree in which it provides positive information about competence (Deci, 1975; Deci & Ryan, 1980). Butler (1987) found that the task- and ego-involving properties of feedback, that map onto Nicholls' (1984) categorization of task and ego orientations – and subsequently mastery and performance orientations – had an effect on what type of factors were attributed to

influence outcomes. Feedback of an informative, process nature included a reinforcing and goal-setting component (e.g., "You thought of quite a few ideas, maybe it is possible to think of more different ideas) (Butler, 1987). When given feedback of this nature, participants attributed their own performance more to task-involved factors such as interest, effort, and previous experience with the task (Butler, 1987). Feedback of a more quantitative or outcome nature that gave information strictly on participant grades was focused on outcomes and was also deliberately non-specific compared to the procedural feedback. For example, participants receiving non-specific feedback were told that their performance was "very good," without reference to the exact components of their performance which merited this praise (e.g., your writing style on this paper was very good) (Butler, 1987). Participants receiving this type of feedback attributed their performance more to ego-involved factors such as ability and competition with others (Butler, 1987). Therefore, using a process and outcome framework for presenting performance results relates feedback content to mastery and performance goals in gaining knowledge of results via informative, prescriptive information and/or non-specific, non-diagnostic information on learners' performance, respectively.

Feedback Sign

Feedback sign (positive or negative) signals that there is a discrepancy between actual and desired performance (Kluger & DeNisi, 1996). Latham and Locke (1991) argue that if the standard of performance is attained, feedback can lead to the setting of and commitment to even more specific, difficult goals. However, if the standard of performance is not reached, feedback can assist the learner in planning and setting goals that are more appropriate to improve upon past performance. Based on research by Elliot

(1999), Elliot and McGregor (2001), and Dweck and Elliott (1983), individuals with a "prove" focus will be striving to prove their competence and achieve success. Once prove-oriented individuals reach their goals, it is expected that they will set additional, more specific goals and will therefore want to learn what they are doing correctly so that they can perform beyond these achievements. Conversely, individuals with an "avoid" focus will be striving to avoid judgments of incompetence and failure. Avoid-oriented individuals will want to know what they are not doing well at so that they can avoid doing poorly on these things. It is expected that avoid-oriented learners will therefore want to know what they are doing incorrectly so they can adjust their strategies accordingly. As such, using a feedback sign framework for presenting performance feedback relates feedback content to achievement motivation in gaining correct or incorrect information on learners' performance.

Point of Reference

As a learner, whether performing better than one's own prior performance or compared to others, can be a motivating factor in a learning environment. Research combining the point of reference of performance results and display of effort and ability can be traced back to Nicholls (1984). Ego involved individuals are concerned with displaying ability to others. Similarly, task involved individuals are interested in how repeated demonstration of effort maximizes their own perceived ability. In evaluating their own performance, performance-oriented individuals gauge ability by comparing their level of performance with the performance of others, whereas mastery-oriented individuals feel control over their own outcomes because they gauge their ability by the amount of effort they display (Button et al., 1996). The link between point of reference

and goal orientation is valuable for understanding the referent of feedback that is of most worth to learners with different goals. Therefore, using a point of reference framework for presenting performance results relates feedback content to mastery and performance goals in gaining information on learners' performance relative to their own past efforts or compared to other performers.

Depth of Information Content

In a complex learning task, learners are faced with integrating information of varying complexity into their existing knowledge. This integration can be done with information that is low in complexity or high in complexity, depending on the content of information that individuals are interested in seeking, learning, understanding, and remembering. The use of information processing strategies has roots in the use of knowledge structures to understand self-regulatory processes focused on learning surface versus deep task concepts (Fitts & Posner, 1967; Gagne, 1970). While the retrieval of information is related to short-term (surface) and long-term (deeper) memory store, the content of information is also related to the nature of memory, and whether the content is based on surface characteristics of a task or more complicated, deeper characteristics of a task (Craik & Lockhart, 1972). Research has shown that the most successful learners should be able to learn and comprehend more surface knowledge before moving on to exploring aspects of a task that are more complicated and require integration of knowledge and strategies. As the complicated relationships in the task are usually built upon more basic understanding of task concepts, basic knowledge is therefore required to advance to learning more complex concepts (Gitomer, 1984; Smith & Good, 1984; Alexander & Judy, 1988). Research also suggests that learners' complex skills are built

on the foundation of more basic knowledge and that mastery goals specifically encourage learners to explore deeper, more complicated information and relationships between task concepts for greater proficiency (Karoly, 1993; Pintrich & Garcia, 1991; Kozlowski, Gully, et al., 2001). Therefore, using a depth of information framework for presenting performance results relates feedback content to mastery and performance goals in gaining information on learners' performance relative to the level of complexity of information that individuals tend to seek out in a learning environment.

While the contribution of feedback to self-regulated learning has been discussed in detail, the four dimensions of feedback have been introduced in a broad sense. More concrete examples of how each of these dimensions relate to the four dimensions of goal orientation (mastery, performance, approach, and avoid) will be explained in the forthcoming section of hypotheses. At present, the relationship between self-regulation, goal orientation, and feedback has been presented (Figure 1). Before moving to the hypotheses, one final section will review the integrated relationship between self-regulation, goal orientation, and feedback and key outcomes of the self-regulated learning process: (1) learner reactions to self-regulated learning and their performance and (2) actual knowledge and performance measures.

Integration of Self-Regulation, Goal Orientation, and Feedback

While the previous sections have primarily addressed the behavioral regulation individuals undergo in a learning environment via goal setting and feedback seeking, individuals also cognitively and affectively regulate their performance based on their behavioral perceptions of outcomes and their progress on a learning task. The relationship between self-regulation, goal orientation, and feedback is useful to examine

in a complex learning environment where individuals have the opportunity to set goals, review feedback on their progress, and regulate their learning and performance along behavioral, cognitive, and affective dimensions. Past research has identified several self-regulatory cognitive processes and affective reactions related to self-regulation, including self-efficacy (Phillips & Gully, 1997), metacognition (Ford et al., 1998), frustration and off task thoughts (Kanfer & Ackerman, 1989), and goal progress (Williams, Donovan, & Dodge, 2000). These reactions are also somewhat coupled with each other, as a learner's perceptions of his goal progress is likely to influence and be influenced by his level of frustration and self-efficacy. A learner's frustration and level of efficacy may in turn impact how often his thoughts drift off task as well as the degree to which he thinks about his performance and plans for future learning. Additionally, a learner's affective reaction to his performance may have an effect on his level of effort on the task and have consequences for his knowledge gained and performance, given he may be feeling good about his abilities and potentially be thinking about things other than the task, for example. While a host of potential scenarios could be created that illustrate the relationships between varying levels of each construct, the next section will review in more detail the general relationship between goal orientation, self-regulation, and the self-regulatory reactions of perceived goal progress, frustration, self-efficacy, off task thoughts, and metacognition, as well as learning and performance outcomes.

Perceived Goal Progress. From the earlier discussion on self-regulation, both control theory (Carver & Scheier, 1981) and social cognitive theory (Bandura, 1989; 1991) presume that regulation of goals is a primary process in the self-regulatory cycle. Increasing sensitivity to goal-performance discrepancies is one function that self-

regulation provides to learners. Control theory and social cognitive theory differ in making predictions on whether progress on learner goals encourages learners to either set new goals that maintain equilibrium or produce new discrepancies (Williams et al., 2000). Nevertheless, from the learner's perspective, gauging perceived goal progress is essential to understanding the individual's desire to regulate towards new goals (Williams et al., 2000). In addition, from a functional perspective, assessment of goals assists learners in evaluating alternative goals and deciding which goals are best to pursue in appraisal of desired performance (Kruglanski et al., 2000). While the literature on perceived goal progress is sparse, knowledge of learner's perceptions of their goal progress in a complex environment is likely to contribute to continued cognitive and behavioral effort on the task if in fact learners feel they are making progress and continue to set new goals for themselves during training.

Frustration. Although self-regulation often aids performance by increasing on-task effort, self-evaluation, and self-monitoring, engaging in self-regulation requires attentional resources. Self-regulation can hinder performance when it demands more from the learner than he is capable of. For example, when a learner is asked to manage cognitive and behavioral demands on his attention, or more simply to do more than one thing at a time, the learner may feel frustrated not only because he is being asked to do many things but because he may also feel unable to comply with this request. An individual can become frustrated due to an inability to manage all of the demands on cognitive resources (Kanfer, Ackerman, Murtha, Dugdale, & Nelson, 1994). Additionally, learning a new task which is cognitively complex, is also likely to be frustrating because it is novel and requires a lot from the learner (Kanfer & Ackerman,

1989; Kanfer et al., 1994). The consequence for learners may be that while self-regulation actively engages cognitive and behavioral regulation, the learner may also feel frustrated. Therefore, combined with potential perceptions of an unsatisfactory level of goal progress, a learner may find that it is frustrating to have the responsibility of executing effective choices in managing and making decisions about his learning in a novel task.

Self-Efficacy. Self-efficacy, or how well one can execute action required to deal with situations, is intertwined with self-regulation in social cognitive theory (Bandura, 1982; 1986). The development of self-efficacy is a result of goal setting, previous experience, performance (Bandura, 1986), and exercising control over a situation (Bandura, 1997). Research on goal setting has shown the reciprocal relationship between goal setting and self-efficacy in that when goals are achieved, the individual's sense of self-efficacy is raised, which causes subsequent goal increases (Schunk, 1990). Efficacy estimates arise from performance accomplishments, as well as monitoring and discrepancy-reduction efforts (Karoly, 1993). Domain-specific efficacy is self-referent and is a very powerful motivating force in the regulation of approach and avoidance mechanisms, and the use of decision strategies and control of performance in complex tasks (Karoly, 1993). While past research on self-efficacy has typically employed a physical task (e.g. Bandura & Cervone, 1983), the belief that an individual can complete a task transfers to a more cognitively complex environment as well. Perceived discrepancies between desired and actual levels of performance in cognitive environments (perceived goal progress) are likely to drive perceptions about one's capabilities to achieve a level of performance on a task (Bandura & Cervone, 1986).

Therefore, an individual's self-regulatory perceptions of goal progress are likely to influence feelings of efficacy or an individual's belief that he can manage a learning situation.

Off Task Thoughts. Research on goals in self-regulation has also shown that goals help in directing action, sustaining effort, and enhancing long term performance and motivation (Bandura, 1982; Carver & Scheier, 1982; Spivack et al., 1976). As such, individuals who are actively regulating around goals are likely to be expending effort in thinking about their performance to reduce actual and perceived discrepancies, planning ahead for future goal strategies, and monitoring progress and focusing attention on the task. In the task environment, because time spent thinking about the task is inversely related to time spent thinking "off task," individuals who are focused on their reactions to their performance on the task are expected to also be thinking about their performance on the task. While on-task thoughts are expected as an individual learns and cognitively regulates about his performance, off task thoughts are generally unexpected and merit further attention. Off task thoughts may also be related to an individual's level of frustration and feelings of self-efficacy, for example, as individuals who are very frustrated and believe they cannot perform the task may in fact choose to think about something else, as a way to protect the low level of efficacy they do have (e.g., Ashforth & Lee, 1990), as thinking about the task may also remind highly frustrated learners that they are not performing at the level they desire.

Metacognition. In a self-regulated learning environment, knowledge of learner cognitions is key for accurate and effective goal setting, skill acquisition, and strategy search and selection (Kanfer & Ackerman, 1989; Earley, Connolly, & Ekegren, 1989).

Differences in individuals' capabilities to appropriately select strategies, evaluate, and monitor their own cognition are likely to have consequences for the self-regulatory cycle in a learning environment (Earley et al., 1989). Metacognition is the individual's knowledge of and control over his cognitions (Flavell, 1979) and is prompted by a learner enacting tactics and strategies in a self-regulated environment (Winne, 1996). Learners who are actively involved in monitoring their learning, identifying errors in performance, and adjusting learning strategies are believed to be comparing their actual level of performance with their desired level of performance, and planning future tactics and strategies for goal achievement (Winne, 1996; Ford et al., 1998). Individuals in a self-regulatory environment who reflect on their thinking and goal progress are expected to invest greater effort and cognitive resources into their learning, perhaps to reduce goal-performance discrepancies (Winne, 1996). Therefore, to aid in effective self-regulation, engaging in metacognition is expected to assist learners in employing successful learning strategies, monitoring performance, and using feedback to assist in future goal setting.

As mentioned previously, in addition to affective outcomes related to self-regulated learning, there are also more concrete measures of effort in learning related to goal orientation, such as time spent on task, task knowledge, and actual performance.

Time spent studying. The amount of time a learner spends studying is not only an indicator of learner effort but is an important outcome separate from performance where effort toward learning can be measured. It is important for learners to study task information and materials prior to opportunities to practice or perform the task in complex, difficult, and novel tasks. Trainees must study task materials to acquire the task knowledge necessary for developing skills and strategies above and beyond what can be

gained through repeated practice (Bell, 1999). Therefore, the amount of time learners spend studying the task materials is an indication of their effort to learn the task.

Time spent reviewing feedback. As explained in more detail in a previous section, feedback is an indicator of performance and allows learners to measure their performance against a standard (Kluger & DeNisi, 1996). Feedback also allows learners to judge their progress and make decisions about future behavior and level of effort. Therefore, the amount of time an individual spends reviewing feedback is an indication of their effort to achieve some standard of performance (Bell, 1999). The more time a learner spends on feedback suggests they are investing more effort into learning and performing well on a task.

Basic and strategic knowledge. One important outcome variable to consider is knowledge and learning gained in the task (Kozlowski et al., 1998). In situations involving complex and difficult tasks, learning can be broken down into two components, basic and strategic knowledge. Basic task knowledge refers to the extent to which a trainee has learned the fundamental principles of a task, while strategic knowledge refers to the extent to which trainees have learned the underlying or deeper elements of a task. Given that feedback informs learners on their level of understanding on the task, both types of task knowledge are appropriate outcomes for measuring the effects of feedback on learning.

Basic and strategic performance. Another outcome variable that is highly salient in training studies is training performance. Performance is defined as the resulting level of achievement in the use of skills and knowledge to achieve a goal. The present study focuses on two types of performance, basic and strategic. Basic performance refers to the

learner's ability to perform fundamental task features and operations, which must be learned in order for participants to develop more advanced skills. Strategic performance refers to a learner's ability to perform more complex and difficult operations, which are based on an understanding of the deeper elements of the task (Bell, 1999). Because performance in these two areas are a result of effort expended on the task, it is expected that trainees who spend more time studying basic parts of the task manual, reviewing feedback on basic aspects of their performance, and have higher basic knowledge are likely to have higher basic performance. Conversely, learners who spend more time on strategic aspects of the manual and feedback will have higher strategic performance.

Generalization performance. Researchers are also beginning to realize that environments in which trainees apply skills and knowledge are dynamic and changing rather than static and constant (Bell, 1999). As a result, it is also important to examine trainees' performance in more complex and difficult situations than what they are presented with in training (Kozlowski, Weissbein, Brown, Toney, & Mullins, 1997). The purpose of this is to measure the extent to which learners can adapt what they have learned to a variety of task demands, often involving increased workload and new challenges. In the present study, trainees' ability to adapt what they have learned will be measured by their performance on a more complex generalization trial. Performance on this trial is an indication of the degree to which trainees have learned both basic and strategic task features. Trainees who are able to perform well on basic and strategic aspects of the task are therefore expected to also do well on the generalization trial. However, relative levels of basic and strategic performance are not enough to gauge trainee performance on the generalization trial. Because the trial is complex and difficult,

successful performance requires learners to efficiently apply the strategic knowledge and skills they have gained during practice, and while basic skills and knowledge are critical in the generalization trial, they alone will not allow the learner to perform well.

Summary

These previous sections have outlined key features of goal orientation, feedback, and self-regulatory and performance outcomes related to self-regulation in a learning environment. Self-regulation serves as an overarching framework to understand the conceptual relationship between goal orientation, feedback, and learner reactions to their performance. Research has shown that self-regulation serves a valuable function in understanding goal setting and performance striving behavior, given differences in individual goals and feedback seeking behavior. Conceptually, research supports the relationship between goal orientation, feedback, and learning outcomes, and the next section will form more specific hypotheses linking these concepts and ideas together.

HYPOTHESES

This next section will present hypotheses related to goal orientation, feedback seeking, and process measures as outlined in Figure 2. While Figure 1 serves as a useful conceptual framework for understanding the relationship between goals, feedback, and learner reactions, separate hypotheses will be proposed for a research model which links goal orientation to feedback and goal orientation to process and learning outcomes. This section first predicts the relationship between goal orientation and the four feedback dimensions and continues with predictions between goal orientation and self-regulatory processes. This is followed by hypotheses linking goal orientation to knowledge and performance outcomes. Finally, as training occurs over time, predictions are made concerning the effects of goal orientation on training outcomes over the course of training.

Goal Orientation and Feedback Content

The four dimensions of feedback introduced earlier include knowledge of results, feedback sign, point of reference, and depth of information content. Given the importance of goal orientation in a self-regulated learning environment, each of these dimensions is also relevant to understanding learner cognition, affective reactions, and behavior. The decision to seek feedback will be motivated by the learner's desire to reduce discrepancies and gain information on his performance and competence. From a goal orientation perspective, mastery-oriented individuals will be interested in increasing their competence and displaying effort (Nicholls, 1984) and as such, will be interested in feedback that assists them in achieving these goals. Therefore, mastery-oriented individuals are likely to seek process feedback that provides direction for controlling

future efforts and reinforces their continued interest, effort, and persistence on the task (Butler, 1987). Conversely, performance-oriented individuals are concerned with revealing their competence and displaying ability (Nicholls, 1984). As such, these individuals will be interested in feedback that provides them with information about their level of competence and outcome performance (Butler, 1987).

H1a: Over the course of training, mastery-oriented individuals are more likely to seek process feedback relative to outcome feedback, while performance-oriented individuals are more likely to seek outcome feedback relative to process feedback.

H1b: Over the course of training, mastery-oriented individuals are more likely to seek process feedback compared to performance-oriented individuals, who are more likely to seek outcome feedback relative to mastery-oriented individuals.

Given the four feedback dimensions of interest, trainees will also have the choice to seek feedback that is either positive or negative. Based on research by Elliot (1999), Elliot and McGregor (2001), and Dweck and Elliott (1983), approach-oriented individuals will be striving to prove their competence and achieve success. Once approach-oriented individuals reach their goals, it is expected that they will set additional, more specific goals and will therefore want to learn what they are doing correctly so that they can perform beyond these achievements. Conversely, avoid-oriented individuals will be striving to avoid judgments of incompetence and failure. Avoid-oriented individuals will want to know what they are not doing well at so that they can avoid doing poorly on these things. It is expected that avoid-oriented learners will therefore want to know what they are doing incorrectly so they can adjust their strategies accordingly.

H2a: Over the course of training, approach-oriented individuals are more likely to seek correct feedback relative to incorrect feedback, while avoid-oriented individuals are more likely to seek incorrect feedback relative to correct feedback.

H2b: Over the course of training, approach-oriented individuals are more likely to seek correct feedback compared to avoid-oriented individuals, who are more likely to seek incorrect feedback compared to approach-oriented individuals.

As a learner, an additional motivating factor is knowledge of whether one's performance is better than one's own self or better compared to others. Research has shown that there are differences in the point of reference individuals use in gauging their own performance (Nicholls, 1984; Elliot & McGregor, 2001). Performance-oriented individuals are concerned with displaying ability to others and therefore are likely to seek feedback of a normative nature. Similarly, mastery-oriented individuals are interested in how repeated demonstration of effort maximizes their own perceived ability and therefore are likely to seek feedback indicating self-referenced changes in performance.

H3a: Over the course of training, mastery-oriented individuals are more likely to seek self-referenced feedback relative to normative feedback, while performance-oriented individuals are more likely to seek normative feedback relative to self-referenced feedback.

H3b: Over the course of training, mastery-oriented individuals are more likely to seek self-referenced feedback compared to performance-oriented individuals, who are more likely to seek normative feedback relative to mastery-oriented individuals.

Finally, research has shown that the depth of information in feedback content that learners seek is likely to be variable across individuals with different goals. Moreover,

mastery-oriented individuals are inclined to become more engaged in learning and report using learning strategies related to integration of complex information (Ames, 1992; Dweck & Leggett, 1988), whereas performance-oriented individuals tend to avoid complicated information (Meece, Blumenfeld, & Hoyle, 1988; Nolen, 1988; Ryan & Grolnick, 1986). In relation to feedback seeking, the type of information individuals review is expected to be related to their depth of involvement in the task. Mastery-oriented individuals, in persisting on difficult aspects of tasks, seeking out challenges, and displaying effort and ability, are likely to build skills and knowledge on complex aspects of the task and advance towards more strategic integration of their knowledge (Dweck, 1986; Pintrich & De Groot, 1990; Schunk, 1990; Zimmerman, 1986). Performance-oriented individuals, in an attempt to conserve effort (Nicholls, 1984), are likely to focus their feedback seeking on more simple aspects of the task, which require less effort to perform and comprehend, and therefore result in a higher perception of ability towards others (Nicholls, 1984).

H4a: Over the course of training, mastery-oriented individuals are more likely to seek feedback on complex aspects of their performance relative to feedback on more basic aspects of performance, while performance-oriented individuals are more likely to seek feedback on basic aspects of their performance relative to feedback on more complex aspects of performance.

H4b: Over the course of training, mastery-oriented individuals are more likely to seek complex feedback compared to performance-oriented individuals, who are more likely to seek basic feedback compared to mastery-oriented individuals.

Goal Orientation and Self-Regulatory Processes

Drawing from Kruglanski et al. (2000), individuals regulating around goals that are founded on more simplistic knowledge and understanding of a task (Meece et al., 1988) are likely to perceive higher progress on goals that are less difficult and require less complex strategies to achieve (Dweck & Leggett, 1988; Fitts & Posner, 1967; Gagne, 1970). Because performance-oriented learners are expected to focus on performance related to basic aspects of the task, and because basic goals are easier to achieve because they are simpler and not complicated (as compared to strategic aspects of a task), these individuals are also expected to report greater progress towards their performance goals.

H5a: Performance-oriented learners will report higher perceived goal progress compared to mastery-oriented learners.

Similarly, to maintain perceptions of goal progress, avoid-oriented learners are expected to report higher goal achievement. Because avoid-oriented individuals are motivated by avoiding failure or looking incompetent (Elliot, 1999), one method to not only mislead others but also convince oneself that one is not incompetent is to report good goal progress. This may also serve as a buffer towards the efficacy of a poor performer towards others finding out that the individual really is incompetent.

H5b: Avoid-oriented learners will report higher perceived goal progress compared to approach-oriented learners.

While mastery-oriented learners are expected to thrive under difficulty and approach challenges from a positive perspective (Dweck & Leggett, 1988), mastery-avoidance learners may be so focused on wanting to avoid misunderstanding material and doing anything incorrectly (Elliot & McGregor, 2001) that they report higher levels of

goal progress than what they are actually achieving, or even set lower goals than their mastery-approach counterparts, as a way to increase their own efficacy and feelings of competence, in light of a challenging environment with potential learning obstacles.

H5c: There will be an interaction between the mastery-performance and the approach-avoidance dimensions of goal orientation such that (1) performance-oriented individuals will report high perceived goal progress regardless of approach- or avoid-orientation and (2) mastery-oriented individuals will report high perceived goal progress only under an avoid-orientation.

Furthermore, research has shown that mastery-oriented individuals seek out challenging opportunities because their goal is to increase their competence (Dweck, 1986). While mastery-oriented individuals also display more problem-solving strategies when faced with failure, facing challenges and difficult situations is likely to be frustrating (Dweck & Leggett, 1988). Because performance-oriented individuals tend to avoid challenges and withdraw from activities they cannot perform (Button et al., 1996), they are likely to experience less frustration in a complex learning environment.

H6a: Mastery-oriented learners will report higher frustration compared to performance-oriented learners.

Compared to an approach-orientation, an avoidance learning orientation is likely to increase learners' sensitivity to failure-relevant information, as avoid-oriented learners are concerned with avoiding failure (Farr et al., 1993). In addition, because avoid-oriented learners are expected to seek negative feedback so as to avoid future poor performances (Kluger & DeNisi, 1996), these learners may begin to focus on the valence of their performance rather than continuing to plan ahead to avoid future poor

performances (Kanfer & Ackerman, 1989). Therefore, avoid-oriented learners are also expected to report higher levels of frustration.

H6b: Avoid-oriented learners will report higher frustration compared to approach-oriented learners.

While avoid-oriented learners are generally expected to be frustrated with their performance, performance-avoid learners are expected to withdraw from challenges, for fear of performing poorly, and will avoid feedback on their performance that indicates low ability (Button et al., 1996). Therefore, in withdrawing from tasks and removing the opportunity to fail, performance-oriented learners are expected to show very low levels of frustration with their performance.

H6c: There will be an interaction between the mastery-performance and the approach-avoidance dimensions of goal orientation such that (1) mastery-oriented individuals will report high levels of frustration regardless of approach- or avoid-orientation and (2) performance-oriented individuals will report low levels of frustration only under an avoid-orientation.

Additionally, mastery-oriented individuals are expected to choose tasks that give them the opportunity to practice, display their skills, and display effort, because they see their ability as something that can be developed (Nicholls, 1984; VandeWalle, 1997). A display of effort for mastery-oriented learners is a display of high ability, and the higher the ability, the higher the expected efficacy of the learner in believing that he has the ability to complete the task. Individuals who effectively self-regulate their cognitions and behavior have also been found to have higher levels of self-efficacy (Schunk & Ertmer, 2000). Therefore, mastery learners who are expected to persevere in light of

failure and challenges will effectively reduce performance discrepancies and set new goals (Bandura & Cervone, 1986), and develop an adaptive response pattern to difficulty (Kozlowski, Gully, et al., 2001; Bell & Kozlowski, 2002b).

H7a: Mastery-oriented learners will report higher self-efficacy compared to performance-oriented learners.

Higher levels of efficacy are also expected in approach-oriented learners who are striving towards positive, desirable outcomes (Elliot & McGregor, 2001). Effort leading to successful performance is likely to increase feelings of efficacy, when compared to avoidance-oriented learners who are focused on avoiding failure.

H7b: Approach-oriented learners will report higher self-efficacy compared to avoid-oriented learners.

In general, while performance-oriented learners are expected to have somewhat lower levels of self-efficacy when compared to mastery-oriented learners, because of their approach motivation, performance-approach learners are also expected to have relatively high levels of efficacy. In focusing on aspects of their performance that are leading to success, and regulating around positive, desirable events (Elliot, 1999), performance-approach learners are expected to hold more positive beliefs about their capabilities than their performance-avoidance counterparts.

H7c: There will be an interaction between the mastery-performance and the approach-avoidance dimensions of goal orientation such that (1) mastery-oriented individuals will report high levels of self-efficacy regardless of approach- or avoid-orientation and (2) performance-oriented individuals will report higher levels of self-efficacy only under an approach-orientation.

Performance-oriented trainees are also concerned with a display of ability towards others (Nicholls, 1984; Dweck, 1986). In showing concern with their current ability compared to others, performance-oriented learners may be too focused on their current performance and fail to plan ahead. In fact, after learning all they feel they need to learn to maintain an acceptable level of performance on a task, performance-oriented learners may begin to coast, or drift off in their thoughts, as a task progresses on (Carver & Scheier, 2000). Therefore, as shown by Button et al. (1996), performance-oriented learners are likely to experience more off task thoughts during their learning experience.

H8a: Performance-oriented learners will report higher off task thoughts compared to mastery-oriented learners.

While approach-oriented learners focus on positive, successful results, avoid-oriented learners are concerned with avoiding failure (Elliot, 1999). This concern with failure may consume cognitive resources and take away from on task cognition (Kanfer & Ackerman, 1989). Therefore, in being consumed with thoughts of failure, avoid-oriented learners may experience a greater amount of off task thoughts.

H8b: Avoid-oriented learners will report higher off task thoughts compared to approach-oriented learners.

Although mastery-oriented learners are expected to experience fewer off task thoughts than performance-oriented learners, mastery-avoid learners may spend much of their time during the task thinking about failure, wanting to avoid misunderstanding material, and how to not make mistakes (Elliot & McGregor, 2001) that their cognitions trail off task.

H8c: There will be an interaction between the mastery-performance and the approach-avoidance dimensions of goal orientation such that (1) performance-oriented individuals will report higher off task thoughts regardless of approach- or avoid-orientation and (2) mastery-oriented individuals will report higher levels of off task thoughts only under an avoid-orientation.

Much research on self-regulation and goal orientation has also focused on the positive benefits of a mastery-orientation to metacognitive activity in a learning environment (e.g., Winne & Perry, 2000). By engaging in thoughtful processing of learning strategies, performance evaluation, and goal setting, mastery-oriented individuals display high levels of ability and actively engage in metacognition in a learning environment (Dweck, 1986; Nicholls, 1984; Ford et al., 1998).

H9a: Mastery-oriented learners will report higher levels of metacognition compared to performance-oriented learners.

Likewise, because approach-oriented learners are interested in successful learning experiences, in a complex learning environment, the effective use of learning strategies in thinking about your learning is likely to result in positive outcomes (Winne & Perry, 2000; Ford et al., 1998). In striving to prove their ability rather than avoiding performing or misunderstanding learning, approach-oriented learners are expected to engage in greater metacognition during learning (Elliot & McGregor, 2001).

H9b: Approach-oriented learners will report higher levels of metacognition compared to avoid-oriented learners.

While an interaction has been proposed for the previous affective outcomes, no interaction is expected between the mastery-performance and approach-avoid dimensions

of goal orientation for metacognition. It is expected that the mastery-performance dimension prevails and will be the dominating cause of any differences between individuals on levels of metacognition.

Goal Orientation and Outcome Measures

In addition to affective outcomes related to self-regulated learning, there are additional constructs of effort in learning related to goal orientation, such as time spent on task, task knowledge, and actual performance. Learners engaging in active displays of effort on a task are likely to spend more time on task, such that repeated effort is thought to maximize ability (Nicholls, 1984). In addition, higher effort in performance is thought to be driven by stronger motivation and higher self-efficacy, which is characteristic of mastery-oriented learners (Bandura, 1997). Therefore, relative to performance-oriented learners who want to only display ability, mastery-oriented learners are expected to expend more effort and spend more time learning material on the task.

H10a: Mastery-oriented learners will expend more cognitive effort studying the task manual compared to performance-oriented learners.

Likewise, approach-oriented learners will also spend more time learning about the task because they are striving for successful performance (Elliot, 1999). In wanting to approach a desirable outcome, studying and learning about the task will facilitate a positive performance.

H10b: Approach-oriented learners will expend more cognitive effort time studying the task manual compared to avoid-oriented learners.

While mastery-oriented learners do want to increase their competence and persevere in the face of challenges (Nicholls, 1984), mastery-avoidance learners also do

not want to fail. Therefore, by focusing on a limited number of learning points, in an effort to perfect their knowledge and skills on these items, the result may be that the learner cannot focus on studying everything. A consequence would therefore be that the learner essentially avoids learning a subset of new task material and in a round-about manner, mastery-avoid learners may believe they cannot fail at something they do not know.

H10c: There will be an interaction between the mastery-performance and the approach-avoidance dimensions of goal orientation such that (1) performance-oriented individuals will expend less cognitive effort studying the task manual regardless of approach- or avoid-orientation and (2) mastery-oriented individuals will expend less cognitive effort studying the task manual only under an avoid-orientation.

More specifically, knowledge gained from the manual can be categorized by material that is more basic, or simple in structure, or more strategic and complex in nature. Understanding more basic knowledge leads to higher basic functionality on the task, while understanding more strategic knowledge leads to higher strategic functionality on the task. It is expected that there will be overall differences in time spent on these different areas of the manual based on differences in state goal orientation. In wanting to seek out challenges, mastery-oriented learners are expected to spend more time studying strategic parts of the manual that foster greater learning because their goal is to increase their competence and utilize more intricate strategies to explore relationships between task concepts for greater proficiency (Karoly, 1993; Pintrich & Garcia, 1991; Dweck & Leggett, 1988). Performance-oriented learners, on the other hand, may be more concerned with developing basic functionality on the task so as to display and reinforce

their level of ability, with less effort, as basic material is less complicated and easier to understand (Nicholls, 1984; Dweck, 1986).

H11a: Over the course of training, mastery-oriented individuals will expend more cognitive effort studying strategic knowledge parts of the manual relative to basic parts, while performance-oriented individuals will expend more cognitive effort studying basic knowledge parts of the manual relative to strategic parts.

H11b: Over the course of training, mastery-oriented individuals are more likely to expend cognitive effort on strategic parts of the manual compared to performance-oriented individuals, who are more likely to expend cognitive effort on basic parts of the manual relative to mastery-oriented individuals.

Time spent on task can also be measured by time spent in total cognitively reflecting on feedback. While specific predictions on the type of feedback have been made previously, in sum, mastery-oriented learners are expected to see feedback as more diagnostic than performance-oriented learners (Kluger & DeNisi, 1996). Feedback is diagnostic and indicates competence, which mastery-oriented learners are concerned with building (Ashford & Cummings, 1983). In comparison, feedback is seen as having low expectancy value for performance-oriented learners, because it generally indicates that more learning is needed (Ashford & Cummings, 1983). For performance-oriented trainees, additional learning would require additional effort, and a display of effort for performance-oriented learners is also an indication of low ability, something that is to be avoided (Dweck & Leggett, 1988).

H12a: Mastery-oriented learners will spend more time cognitively reflecting on feedback compared to performance-oriented learners.

Feedback is also seen as judgmental as it indicates to the learner his relative performance on a task (Bobko & Colella, 1994; Farr, 1993; Kanfer, 1990). As approach-oriented learners are curious about positive judgments about their performance, avoidance-oriented learners may stay away from feedback as it may reveal they are performing poorly, which is an evaluation they wish to avoid.

H12b: Approach-oriented learners will spend more time cognitively reflecting on feedback compared to avoid-oriented learners.

Although a mastery-orientation encourages learners to develop their competence and knowledge, and reviewing feedback assists in self-regulation by increasing knowledge of goal achievement, mastery-avoid learners want to avoid failure. By not spending as much time reviewing feedback as their mastery-approach counterparts, they avoid learning how well or poorly they are performing. Essentially by keeping themselves in the dark relative to their level of performance, mastery-avoid learners avoid judgments of failure.

H12c: There will be an interaction between the mastery-performance and the approach-avoidance dimensions of goal orientation such that (1) performance-oriented individuals will spend less time reviewing feedback regardless of approach- or avoid-orientation and (2) mastery-oriented individuals will spend less time reviewing feedback only under an avoid-orientation.

Other important outcome variables to consider are knowledge and learning gained in the task (Kozlowski et al., 1998). In situations involving complex and difficult tasks, learning can be broken down into two components, basic and strategic knowledge. Basic task knowledge refers to the extent to which a trainee has learned the fundamental

principles of a task, while strategic knowledge refers to the extent to which trainees have learned the underlying or deeper elements of a task. Given that feedback informs learners on their level of understanding on the task, both types of task knowledge are appropriate outcomes for measuring the effects of feedback on learning. However, because the complicated relationships in a task are usually built upon more basic understanding of task concepts, basic knowledge is therefore required to advance to learning more complex concepts (Gitomer, 1984; Smith & Good, 1984; Alexander & Judy, 1988). Research also suggests that learners' complex skills are built on the foundation of more surface knowledge (Karoly, 1993; Pintrich & Garcia, 1991; Kozlowski, Gully, et al., 2001). Therefore, because mastery goals specifically encourage learners to explore deeper, more complicated information and relationships between task concepts for greater proficiency, which are based upon more basic knowledge, it is expected that there will be no differences between mastery- and performance-oriented learners on levels of basic knowledge, as both mastery- and performance-oriented learners must study, practice, and review this information to reach their respective goals.

H13a: There will be no differences between mastery- and performance-oriented learners on levels of basic knowledge.

In considering a learner's approach or avoidance motivation, because approach-oriented learners are expected to spend more time studying the task manual and reviewing feedback, they will be likely to achieve higher levels of knowledge than avoidance-oriented learners, who are expected to spend less time on task. In addition, approach-oriented learners are focused on proving their competence (Elliot, 1999) and will likely have spent more time studying to learn basic information.

H13b: Approach-oriented learners will achieve higher basic knowledge compared to avoid-oriented learners.

Likewise, when considering strategic knowledge, because mastery goals specifically encourage learners to explore deeper, more complicated information and relationships between task concepts for greater proficiency (Karoly, 1993; Pintrich & Garcia, 1991; Kozlowski, Gully, et al., 2001), learners who spend more time studying strategic aspects of the manual and reviewing feedback on strategic aspects of their performance will also have higher strategic task knowledge.

H14a: Mastery-oriented learners will achieve higher strategic knowledge compared to performance-oriented learners.

In considering a learner's approach or avoidance motivation, because approach-oriented learners are expected to spend more time studying the task manual and reviewing feedback, they will be likely to achieve higher levels of knowledge than avoidance-oriented learners, who are expected to spend less time on task. In addition, approach-oriented learners are focused on proving their competence (Elliot, 1999) and will likely have spent more time studying to learn strategic information.

H14b: Approach-oriented learners will achieve higher strategic knowledge compared to avoid-oriented learners.

Similar to the hypothesis generated for expected differences in metacognition across mastery- and performance-oriented learners, no interaction is expected between the mastery-performance and approach-avoid dimensions of goal orientation related to strategic knowledge as the mastery dimension is expected to prevail and be the dominant cause for any differences between learners.

Another outcome variable that is highly salient in training studies is training performance. Performance is defined as the resulting level of achievement in the use of skills and knowledge to achieve a goal. The present study focuses on two types of performance, basic and strategic. Basic performance refers to the learner's ability to perform fundamental task features and operations, while strategic performance refers to a learner's ability to perform more complex and difficult operations, which are based on an understanding of the deeper elements of the task. The same logic describing the relationship between mastery-performance dimension and basic task knowledge applies to the relationship between the mastery-performance dimension and basic performance. Because there are no expected differences between mastery- and performance-oriented learners on levels of basic knowledge, no difference is expected on levels of basic performance, as both mastery- and performance-oriented learners are expected to have similar levels of basic task knowledge, which is required for successful basic task performance.

H15a: There will be no differences between mastery- and performance-oriented learners on levels of basic task performance.

In considering a learner's approach or avoidance motivation, however, because approach-oriented learners are expected to spend more time studying the task manual and reviewing feedback, they will be likely to achieve higher levels of basic performance than avoidance-oriented learners, who are expected to spend less time on task.

H15b: Approach-oriented learners will achieve higher basic performance compared to avoid-oriented learners.

When considering strategic levels of performance, however, it is expected that trainees who spend more time studying strategic parts of the task manual, reviewing feedback on strategic aspects of their performance, and have higher strategic knowledge are likely to have higher strategic performance.

H16a: Mastery-oriented learners will achieve higher strategic performance compared to performance-oriented learners.

In considering a learner's approach or avoidance motivation, because approach-oriented learners are expected to spend more time studying the task manual and reviewing feedback, they will be likely to achieve higher levels of strategic performance than avoidance-oriented learners, who are expected to spend less time on task.

H16b: Approach-oriented learners will achieve higher strategic performance compared to avoid-oriented learners.

While mastery-oriented learners are expected to achieve higher levels of strategic performance compared to performance-oriented learners, mastery-avoid learners are also expected to show slightly lower levels of strategic performance than their mastery-approach counterparts. Because avoidance-oriented learners are concerned with avoiding negative events, and performance on strategic aspects of the task requires greater investment of resources and effort, mastery-avoid learners may see this as too risky and choose to avoid the possibility for low performance by avoiding strategic aspects of the task (Kanfer & Ackerman, 1989; Elliot, 1999). Therefore, compared to mastery-approach learners, it is expected that mastery-avoid learners will display lower levels of strategic task performance.

H16c: There will be an interaction between the mastery-performance and the approach-avoidance dimensions of goal orientation such that (1) performance-oriented individuals will display low levels of strategic task performance regardless of approach- or avoid-orientation and (2) mastery-oriented individuals will display lower strategic performance only under an avoid-orientation.

The extent to which learners can adapt what they have learned to a variety of task demands, often involving increased workload and new challenges, is also of interest. In the present study, trainees' ability to adapt what they had learned will be measured by their performance on a more complex generalization trial. Performance on this trial is an indication of the degree to which trainees have learned both basic and strategic task features. Trainees who are able to perform well on basic and strategic aspects of the task are therefore expected to also do well on the generalization trial. However, relative levels of basic and strategic performance are not enough to gauge trainee performance on the generalization trial. Because the trial is complex and difficult, successful performance requires learners to efficiently apply the strategic knowledge and skills they have gained during practice. As such, mastery-oriented learners, who are expected to have higher strategic knowledge and performance than performance-oriented learners, are also expected to perform well during a generalization trial.

H17a: Mastery-oriented learners will achieve higher generalization performance compared to performance-oriented learners.

Likewise, learners focused on proving their competence will be more likely to succeed on the generalization trial than learners focused on avoiding failing. Because the generalization trial is designed to be difficult, complex, and challenging, avoidance-

oriented trainees are likely to view the trial as an opportunity for them to fail, and will avoid performing on this trial.

H17b: Approach-oriented learners will achieve higher generalization performance compared to avoid-oriented learners.

While mastery-oriented learners in general are expected to perform well on the generalization trial, the performance of mastery-avoid learners may be hampered by their fear of failure, wanting to avoid misunderstanding material, and avoid making mistakes (Elliot & McGregor, 2001). Therefore, mastery-avoid learners are expected to show a lower level of generalization performance than their mastery-approach counterparts.

H17c: There will be an interaction between the mastery-performance and the approach-avoidance dimensions of goal orientation such that (1) performance-oriented individuals will display low levels of generalization performance regardless of approach- or avoid-orientation and (2) mastery-oriented individuals will display lower generalization performance only under an avoid-orientation.

Considering the Effects of Time on Process and Outcome Measures

Realizing that the effects of training are likely to unfold over time, and over the course of a training session, it is also important to re-examine several of the previously proposed relationships. While not all process and outcome relationships are expected to change over time, those expected to show differences are discussed below.

Perceived Goal Progress

Referring to Hypothesis 5, the level of perceived goal progress is predicted to be higher for performance-oriented learners and avoidance-oriented learners. However, over the course of training, it is expected that the level of perceived goal progress will

decrease for mastery-avoid learners. Throughout training, mastery-avoid trainees are expected to focus on avoiding forgetting what they have learned and seeking feedback on aspects of the task they have been doing incorrectly. While mastery-avoid learners want to avoid poor performance, they may also be discouraged by the end of training and realize they have not completely avoided showing themselves that they did not do well on this task. As a result, it is expected that mastery-avoid learners will report less goal progress over the course of training, perhaps in reaction to learning that they have not achieved their goals as well as they had hoped.

H18: Over the course of training, there will be a three-way interaction between the mastery-performance dimension, approach-avoid dimension, and time, causing the level of perceived goal progress predicted in Hypothesis 5 to change, such that the level of perceived goal progress in mastery-avoid learners is expected to decrease over time.

Frustration

Referring back to Hypothesis 6, the level of frustration is expected to be higher for mastery-oriented and avoidance-oriented learners. However, over the course of training, the frustration of mastery-avoid and performance-avoid learners is expected to change such that mastery-avoid learners become increasingly frustrated while performance-avoid learners become less frustrated. Because mastery-avoid learners spend training showing themselves that they cannot fail at this task, are avoiding not fully learning about the different parts of the simulation, and avoiding forgetting what they have learned about this task, their level of frustration is expected to increase due to the demands placed on both avoiding not fully learning material and avoiding showing themselves that they are doing poorly. Performance-avoid learners, on the other hand,

are expected to withdraw from the task over the course of training to avoid encountering learning obstacles and showing others that they are poor performers, and therefore their level of frustration is expected to decline over the course of training, because they are no longer being challenged by the training material.

H19: Over the course of training, there will be a three-way interaction between the mastery-performance dimension, approach-avoid dimension, and time, causing the level of frustration predicted in Hypothesis 6 to change, such that:

H19a: The level of frustration in mastery-avoid learners is expected to increase over time, and,

H19b: The level of frustration in performance-avoid learners is expected to decrease over time.

Self-Efficacy

Referring back to Hypothesis 7, the level of self-efficacy is expected to be higher for both mastery-oriented and approach-oriented learners. However, over the course of training, the efficacy of mastery-avoid learners is expected to decline while the efficacy of performance-approach learners is expected to increase. Because of their avoidance focus, over the course of training, mastery-avoid learners are expected to report lower self-efficacy because of their focus on avoiding negative events, whereas performance-approach learners are expected to report higher self-efficacy over the course of training because of their approach focus in striving towards positive events.

H20: Over the course of training, there will be a three-way interaction between the mastery-performance dimension, approach-avoid dimension, and time, causing the level of self-efficacy predicted in Hypothesis 7 to change, such that:

H20a: The level of efficacy in mastery-avoid learners is expected to decline over time, and,

H20b: The level of efficacy in performance-approach learners is expected to increase over time.

Off Task Thoughts

Referring to Hypothesis 8, the level of off task thoughts is predicted to be higher for performance-oriented learners and avoidance-oriented learners. However, over the course of training, it is expected that the level of off task thoughts will increase for both performance-approach and mastery-avoid learners. Throughout training, performance-approach trainees may invest less effort in their performance such that their positive feelings about their performance may encourage them to coast and pull back on allocating cognitive resources to the task (Carver & Scheier, 2000). Therefore, the level of off task thoughts, over the course of training, is expected to increase. Mastery-avoidance learners are also expected to experience more off task thoughts over the course of training as they will increasingly be consumed with thoughts of not wanting to fail and not wanting to forget material, which may take away from their on task cognitions.

H21: Over the course of training, there will be a three-way interaction between the mastery-performance dimension, approach-avoid dimension, and time, causing the level of off task thoughts predicted in Hypothesis 8 to change, such that:

H21a: The level of off task thoughts in performance-approach learners is expected to increase over time, and,

H21b: The level of off task thoughts in mastery-avoid learners is expected to increase over time.

Time Spent Studying Task Manual and Reviewing Feedback

Referring back to Hypotheses 10 and 12, mastery-oriented and approach-oriented learners are expected to spend more time studying the task manual and reviewing feedback. However, over the course of training, performance-approach learners are expected to spend less time studying the manual and feedback. For the same reasons that they are expected to also experience more off task thoughts as training progresses, performance-approach learners are expected to expend less effort and allocate fewer cognitive resources to the task (Carver & Scheier, 2000). Therefore, time spent studying the manual and reviewing feedback is expected to decrease.

H22: Over the course of training, there will be a three-way interaction between the mastery-performance dimension, approach-avoid dimension, and time, causing the amount of cognitive effort studying the task manual predicted in Hypothesis 10 to change, such that the cognitive effort spent studying the task manual in performance-approach learners is expected to decrease over time.

H23: Over the course of training, there will be a three-way interaction between the mastery-performance dimension, approach-avoid dimension, and time, causing the amount of cognitive reflection on feedback predicted in Hypothesis 12 to change, such that the amount of cognitive reflection on feedback in performance-approach learners is expected to decrease over time.

METHODS

Design

Overview. This study employed a 2 (mastery vs. performance) by 2 (approach vs. avoid) fully crossed between-subjects design. The experiment took place in a single session consisting of three blocks, each block consisting of three trials, for a total of nine training trials. Blocks (3) and trials (9) both represented within subjects factors. Following the training blocks, the trainees engaged in a generalization trial in which the workload (e.g., more targets, length of trial was doubled) and the complexity of the task (e.g., the rules and principles underlying task proficiency were modified) were increased. The purpose of this trial was to measure the extent to which the trainees' acquired skills were adaptable.

Simulation. The PC-based decision making simulation TANDEM (see Kozlowski & Gully, 1996; Weaver, Bowers, Salas, & Cannon-Bowers, 1995; Weaver, Morgan, Hall, & Compton, 1993) served as the experimental platform. This platform is a low physical fidelity simulation of a naval radar tracking task, which provides a high psychological fidelity for complex and difficult decision making and information processing tasks. The task was originally developed by the Naval Air Warfare Center Training Systems Division (NAWCTSD) and the University of Central Florida. The original task has undergone extensive design modifications to create the current version of TANDEM (version 8.1f), which provides a dynamic, self-contained, and completely novel task environment. The current version of TANDEM allows researchers to examine the process of training individuals on a complex task and developing adaptive expertise. The simulation was designed to include events that unfold in real time that can be scripted by

the researcher. In addition, the researcher has control over what performance information trainees are given, what decisions they need to make, and how the performance of these actions are scored.

The current version of TANDEM, which was used in this study, is referred to as the Tactical Action Project (TAP). During TAP, each participant is seated at a simulated radar console upon which multiple contacts are presented. The trainee must gather information about each contact by "hooking" the target, gathering information about its characteristic "cue values," and making a final decision about the target's disposition based on information gathered. Using this information, the trainee then makes a final decision about what action to take against the target (shoot or clear). Three cues are available for each of the component decisions (nine cues overall), which must be made in the following order: (1) Type (air, surface, or submarine); (2) Class (civilian or military); (3) Intent (peaceful or hostile); and (4) Engage (shoot or clear).

Skill components. Throughout training, all participants had access to a comprehensive training manual. During a 2.5-minute period before each trial, the manual was presented on-line so as to provide the capability of tracking the content and duration of studied material. Three sets of skills are documented in the comprehensive manual. These sets included basic functionality, declarative knowledge, and strategic knowledge.

Basic functionality on the task involves learning those features of the program, in terms of both hardware and software, which make it possible to perform the task. Task features which must be learned in order for a participant to perform well on TAP include hooking targets, accessing cue menus, and "zooming" to alter the display radius. In

addition, individuals need to understand several basic functions of a PC, such as using a mouse and keyboard.

Declarative knowledge is also required to process information and render target sub-decisions. The cue information is accessed from pull-down menus, with three cues available for each of the three component decisions. Based on the cue information provided, individuals must determine the Type (air, surface, submarine), Class (civilian or military), and Intent (peaceful or hostile) of each target. After making these sub-decisions, participants are required to either shoot targets (if hostile) or clear them from the radar screen (if peaceful). To make correct decisions, individuals must not only learn the cue values but also must learn the proper procedure for making target decisions. For example, individuals must make the Type decision first, followed by the Class decision, and then the Intent decision. If they do not make the decisions in this order or do not make all the sub-decisions, they will not be allowed to make a final target decision. Also, sometimes the radar will provide a conflicting cue value for a target. When this occurs, individuals must choose the option indicated by the majority of cues (2 out of 3).

For individuals to successfully progress to learning the strategic aspects of the game, it is important that they first become proficient at making correct and efficient component and final engagement decisions. These skills, which are a foundation for later strategic skills, are measured by indicators of basic performance, such as number of correct sub-decisions and final engagement decisions.

Strategic knowledge involves the participant's ability to understand the deeper elements of the simulation and to develop two critical strategic skills: situational assessment and target prioritization. Three elements of the task (using the zoom function,

identifying defensive perimeters, and locating and utilizing marker targets) are relevant to situational assessment. The zoom function allows participants to either expand (zoom out) or constrict (zoom in) the radius of their radar screen. Participants need to "zoom out" to determine the overall situation in which they are operating. This action is critical because of the presence of two "defensive perimeters" within the task. The inner defensive perimeter, located at 10NM, is clearly marked and easy for participants to identify. However, the outer perimeter, located at 256 NM, is beyond the initial viewing range of 32 NM, and is not clearly marked. Thus, participants must first "zoom out" and then locate "marker targets" that serve to identify the outer boundary.

Target prioritization requires the trainee to utilize a separate set of strategic skills. Decisions about which targets constitute the greatest threats to the participant's defensive perimeters are critical, as the scenarios are designed so there are often multiple targets approaching each perimeter, some of which are more threatening than others. The order in which targets should be prosecuted should be based on two pieces of information, speed and distance from the perimeter. Faster targets are of higher priority than slower targets because they will penetrate the defensive perimeters more quickly. Also, targets close to either of the defensive perimeters are of higher priority than those that are farther away. Thus, the highest priority targets are those that are both (a) moving quickly and (b) near a defensive perimeter. Trainees also need to "trade off" targets approaching their inner and outer perimeters. Strategic decisions related to such trade-offs revolve around the number of targets at each perimeter, their priority, and their "cost" if they penetrate the perimeters.

Procedure

On-line signup. Participants registered for the current study through the Psychology department subject pool website. After selecting a date and time to participate in the experiment, participants read a consent form that pertained only to the on-line section of the experiment (see Appendix A). Next, participants completed an on-line questionnaire designed to collect demographic information, measure participants' trait goal orientation, positive and negative affect, affect intensity, and action-state orientation (see Appendix D). This on-line portion of the experiment took about 30 minutes.

Participants. A total of 393 undergraduates at a large Midwestern university participated in the present study.[2] All participants were volunteers who received course credit for their participation in the four hour experiment. The majority (93.9%) of participants was between the ages of 18-23 and 52.2% of participants were female. The sessions were conducted with groups of students consisting from one to 16 participants. These groups were randomly assigned to one of the four experimental conditions, resulting in a relatively even distribution of participants across the four experimental conditions. Between conditions, 102 students were given the mastery-approach manipulation, 101 students the mastery-avoid manipulation, 98 students the performance-approach manipulation, and 92 students the performance-avoid manipulation (203 in mastery condition, 190 in performance condition, 200 in approach condition, and 192 in avoid condition.)

[2] A total of 24 participants were dropped from the sample for various reasons, including incomplete data and not following experimenter instructions. No one condition was more or less affected by the removal of data from the sample.

Using power analysis, it was found that a sample of 400 participants (approximately 100 per cell) resulted in 13% power to detect small (d=.20) effect sizes, 82% power to detect medium (d=.50) effect sizes, and 99% power to detect large (d=.80) effect sizes (Murphy & Myors, 1998).

Informed consent. When participants arrived at the lab for the training portion of the experiment, they were asked to complete a second consent form (see Appendix B). Also, participants signed an SAT/ACT release form that allowed access to their test scores from the Registrar's Office (see Appendix C).

Demonstration and familiarization. Following completion of the consent form and SAT/ACT forms, the experimenter then read a short introduction to the experiment and verbally and visually introduced the goal framework and state manipulation participants were instructed to adopt during the experiment (described in Manipulations section below). Next, the experimenter provided participants with a brief demonstration of the task, outlining its features and decision sequence. During this demonstration, the experimenter briefly displayed how to hook targets, use the pull down menus, use the zoom function, and make decisions in the proper order. The experimenter demonstrated how to use the on-line manual and how to scroll through the feedback. Following the demonstration, the experimenter re-introduced the goal manipulation.

Pre-training questionnaire. After the demonstration, trainees reported their goals for the first set of training trials (trials 1-3) and answered a set of questions on their commitment to their goals and their overall training motivation (see Appendix E).

Practice. After the pre-training questionnaire, trainees began the practice section of the training program. The practice section consisted of three blocks, each block

consisting of three trials, for a total of nine training trials. Each training trial was composed of a cycle of study, practice, and feedback. Participants had 2.5 minutes to study an on-line manual that contained information on all important aspects of the task, 4 minutes of hands-on practice, and 3 minutes to review their feedback.

Feedback. Accurate and truthful feedback on all aspects of the task relevant to four dimensions of the task was available immediately following the completion of each practice trial. The feedback was categorized along four dimensions: basic vs. strategic, incorrect vs. correct, process vs. outcome, and self-referenced vs. normative. In choosing what feedback to view, trainees had to first select whether they wished to see basic or strategic information. These two choices were randomized when presented on the screen. Next, participants could choose whether to view process or outcome feedback or self-referenced or normative feedback. These four choices were randomly presented on the computer screen, and within each of the four categories, participants were also given the option to view that type of feedback as either decisions they had made correctly or incorrectly. The choice to view feedback as correct or incorrect decisions was also presented in randomized order within the four higher order categories of feedback (process, outcome, self-referenced, and normative). In sum, participants could view as many of the sixteen sub-categories of feedback as they wanted during the allotted 3-minute feedback time. The choices appeared on the feedback menu, and participants were able to choose which type they wanted, and then return to the feedback menu when they were finished. A program designed specifically for this type of study tracked which types of feedback participants viewed, the order in which the choices were viewed, and

how much time they spent on each type of feedback. An example of the feedback available to trainees is provided in Appendix F.

Basic feedback was labeled "Things about my performance on basic parts of the task" on the feedback menu. If participants chose basic feedback, they were then given the option to view information either as what they had done correctly or incorrectly along four dimensions: process, outcome, self-referenced, and normative. Basic correct process feedback was labeled "Ways to improve my performance" on the feedback menu and gave participants information on how to improve their basic-process performance by studying the manual to make correct decisions, correctly prosecute targets, and improve the score by continuing to make correct decisions. Basic incorrect process feedback was labeled "Ways to stop making bad decisions" on the feedback menu. This option gave participants information that they should study the manual on ways to stop making incorrect decisions, how to stop incorrectly prosecuting targets, and improve the score by stopping incorrect decisions.

Basic correct outcome feedback was labeled as "Decisions I have made that are helping my score" on the feedback menu. This option gave participants information on the number of correct decisions they had made regarding Type, Class, Intent, and Final Engagement decisions on targets, number of peaceful targets correctly cleared, number of hostile targets correctly prosecuted, and their score from performing basic aspects of the task correctly. Basic incorrect outcome feedback was labeled "Decisions I have made that are hurting my score" on the feedback menu. This option gave participants information on the number of incorrect decisions they had made regarding Type, Class, Intent, and Final Engagement decisions on targets, number of peaceful targets incorrectly

prosecuted, number of hostile targets incorrectly cleared, and their score from performing basic aspects of the task incorrectly. Task score was computed by adding 100 points to the trainee's score every time a target was identified and prosecuted correctly, and subtracting 100 points from the trainee's score each time a target was misidentified or prosecuted incorrectly. In addition, 40 points were deducted from the trainee's score for each target that crossed a defensive perimeter.

Basic correct self-referenced feedback was labeled "What I've done correctly relative to my past performance" on the feedback menu. This option gave participants information that over the course of the last practice trial, they had increased the number of correct decisions they had made regarding Type, Class, Intent, and Final Engagement decisions on targets, number of peaceful targets correctly prosecuted, number of hostile targets correctly prosecuted, and their score from performing basic aspects of the task correctly relative to how they did on the previous practice trial. Basic incorrect self-referenced feedback was labeled "What I've done incorrectly relative to my past performance" on the feedback menu. This option gave participants information that over the course of the last practice trial, they had decreased the number of incorrect decisions they had made regarding Type, Class, Intent, and Final Engagement decisions on targets, number of peaceful targets correctly prosecuted, number of hostile targets correctly prosecuted, and their score from performing basic aspects of the task correctly relative to how they did on the previous practice trial.

Basic correct normative feedback was labeled "What I've done correctly compared to others" on the feedback menu. This option contained the same information as the basic correct self-referenced category but benchmarked performance relative to the

50th and 85th percentile. These cutoffs were chosen because previous studies using this paradigm show that participants can perform at the 50th percentile with minimal effort and practice, but performing at the 85th percentile is a difficult, yet attainable goal (Bell & Kozlowski, 2002a; Dobbins, 2002). Basic incorrect normative feedback was labeled "What I've done incorrectly compared to others" on the feedback menu. This option also contained the same information as the basic incorrect self-referenced category but benchmarked performance relative to the 50th and 85th percentile on the performance objectives.

The same eight options (correct process, incorrect process, correct outcome, incorrect outcome, correct self-referenced, incorrect self-referenced, correct normative, incorrect normative) were available if participants chose strategic feedback, which was labeled "Things about my performance on advanced parts of the task," although the content of the information was different (see Appendix F for content). The strategic feedback menu labels were also the same for these eight options as they were for basic feedback.

Prior to each training block, the experimenter reinforced the goal manipulations by reminding participants of their objectives for the session. Participants were also asked to report their goals for the session prior to training blocks 2 (trials 4-6) and block 3 (trials 7-9). They also reported their commitment to their goals at these two times as well. Following the third and ninth practice trials, participants completed measures of self-efficacy, metacognitive activity, commitment to objectives, state goal orientation, frustration, off task thoughts, and perceived goal progress. In addition, participants

completed a basic and strategic knowledge test following the third and ninth trials. Participants were given a 5-minute break following the third and ninth trials.

Transfer. Following the training blocks, trainees completed a manipulation check (Appendix E) and participated in two additional trials designed to measure the extent to which they could transfer their skills and knowledge. In the first trial, the task possessed a format similar to the training trials. This trial was designed to measure individuals' near transfer performance (e.g., training performance). Trainees received feedback regarding only their score on this trial.

The near transfer test was followed by a far transfer or generalization trial, in which the workload (e.g., more targets, length of the trial was doubled) and complexity (e.g., the principles and rules underlying task proficiency were modified) of the task was increased. To increase the workload, the number of targets was increased from 22 to 60, a 172% increase. In addition, the length of the generalization trial was increased from four to ten minutes. Task complexity was heightened by (1) including more "pop-up" targets, which appeared suddenly on the screen; (2) changing the "rules of engagement" so that a greater number of points were deducted when targets crossed the visible inner perimeter (175 points) and the invisible outer defensive perimeter (125 points); (3) creating more defensive perimeter intrusions; (4) creating "pop-up" targets that appeared very close to defensive perimeters; and (5) differentially distributing boundary intrusions to create a situation in which many targets threatened the outer perimeter, while fewer targets threatened the inner perimeter, requiring strategic trade-offs on the part of trainees. Following the near transfer test, trainees received instructions describing the important task differences they would encounter in the far transfer session. Effective

performance on the generalization trial required that trainees adapt the knowledge and skills they have acquired throughout training to a new and more complex situation.

After completing the far transfer trial, participants were fully debriefed and dismissed (see Appendix G). In its entirety, the experimental session lasted 3 1/2 hours.

Incentives. Cash awards were offered for (a) questions answered during the training trials (knowledge) and (b) performance on the final two trials. The instructions at the beginning of training indicated that trainees would be asked to answer questions throughout the training program, emphasizing that they needed to "...think carefully about your answers to the questions." They were told that awards would be given to the three individuals who answered these questions the best, and that three additional awards would be given to the players who did the best on the final two trials. Written instructions regarding incentives were provided to trainees at the beginning of the experiment, and they were reminded of the incentives by the experimenter just prior to the start of the generalization trials. These instructions are presented in Appendix H.

Manipulations

The combination of goal orientation manipulations and achievement motivation focus manipulations in this study determined the type of goal framework participants were instructed to adopt throughout this experiment. The goal orientation manipulation determined the whether an individual would focus on a mastery or performance framework in developing their understanding of the task. The achievement manipulation determined whether an individual would be focused on proving their ability (approach focus) on the task or avoiding failure (avoid focus). The types of instructions given are consistent with research on goal orientation (Button et al., 1996; VandeWalle, 1997;

Elliot & McGregor, 2001) and achievement motivation (Elliot, 1999; Elliot & Covington, 2001; Elliot & Thrash, 2001). In each experimental session, prior to viewing the demonstration, all participants were told:

"Over the course of nine sessions, you will have an opportunity to study the radar simulation manual, practice the simulation, and review information about how you are doing. In a moment the lab associate will give you a demonstration of the simulation and show you how to operate this task. You should use the opportunities you're given in the task to set some goals for yourself and use the time you have to study, practice and review information to help you work towards those goals."

Then, one of the following manipulations was read to participants. Prior to the start of the session, one of the manipulations was randomly chosen to be used for that day's session. This manipulation was verbally and visually introduced during the familiarization stage of the study and was reinforced throughout the training prior to participants studying the manual.

Mastery-approach. "As a naval officer, your primary responsibility is to follow directions from superior officers and to strive toward mastering your simulation skills. You may want to think of your objectives today as directions from your superior, and work towards these objectives so that you can learn as much as possible about the simulation and be successful. You want to excel, succeed, and master the TAP simulation. Therefore, your primary objectives during this session will be to use the time you have to study, practice, and review information on how you are doing to:

- Learn, develop, and master your TAP skills
- Use feedback to identify where your knowledge and skills may be improved
- Use mistakes as opportunities to help you learn where you can get better
- Use your practice time and effort to improve your understanding of TAP
- Mastery of TAP is under your control

These objectives will help you develop a mindset that you should use to approach your study and performance today. Remember, your job as First Officer is to commit to these objectives and rely on them to guide your learning and help you do your best. Good luck and thank you for participating."

Mastery-avoid. "As a naval officer, your primary responsibility is to follow directions from superior officers and avoid failing to master your simulation skills. You may want to think of your objectives today as directions from your superior, and work towards these objectives so that you can avoid failing to master the TAP simulation. You

do not want to fail to learn everything there is to know about TAP during your training session today. Therefore, your primary objectives during this session will be to use the time you have to study, practice, and review information on how you are doing to:

- Avoid making mistakes while you learn and develop your TAP skills
- Use feedback to identify where you are lacking in understanding about TAP
- Focus on mastering all dimensions of TAP without making mistakes
- Avoid letting your knowledge decline from trial to trial
- Mastery of TAP is under your control

These objectives will help you develop a mindset that you should use to approach your study and performance today. Remember, your job as First Officer is to commit to these objectives and rely on them to guide your actions and help you to avoid not learning about TAP. Good luck and thank you for participating."

Performance-approach. "As a naval officer, your primary responsibility is to follow directions from superior officers and be an example to your fellow officers and to your subordinates. You may want to think of your objectives today as directions from your superior, and work towards these objectives so that you can be successful in front of your fellow officers. You want your peers to see you succeeding, and you want to set a good example by doing well during your training session today. Therefore, your primary objectives during this session will be to use the time you have to study, practice, and review information on how you are doing to:

- Work to demonstrate your TAP ability and improve your score
- Use feedback to identify where you can work to increase your score
- Get the maximum score possible
- Show others how good a score you can get at TAP
- Achieving a high score on TAP is under your control

These objectives will help you develop a mindset that you should use to approach your study and performance today. Remember, your job as First Officer is to commit to these objectives and rely on them to guide your performance and help you succeed. Good luck and thank you for participating."

Performance-avoid. "As a naval officer, your primary responsibility is to follow directions from superior officers and be an example to your fellow officers and to your subordinates. You may want to think of your objectives today as directions from your superior, and work towards these objectives so that you can avoid failing in front of your fellow officers. You do not want your peers to see you fail, and you do not want to set a bad example by doing poorly during your training session today. Therefore, your primary objectives during this session will be to use the time you have to study, practice, and review information on how you are doing to:

- Avoid parts of TAP where you might encounter difficulty
- Use feedback to identify parts of TAP that are too tough

- Don't work too hard on parts of TAP that are challenging to you
- Avoid letting others see that you aren't performing well
- Avoiding a poor performance on TAP is under your control

These objectives will help you develop a mindset that you should use to guide your studying, how and what you practice, and what you review to monitor how you are doing. Remember, your job as First Officer is to commit to these objectives and rely on them to guide your performance and help you avoid failing and performing poorly. Good luck and thank you for participating."

Measures

As indicated previously, participants were asked to complete several measures on-line when they registered for the experiment. These measures collected demographic information about participants, assessed individuals' trait goal orientation, positive and negative affect, affect intensity, and action-state orientation. These on-line measures are presented in Appendix D.

Several active learning processes and training outcomes were also assessed during the experimental session. Following the third and ninth practice trials, participants completed measures of self-efficacy, metacognitive activity, commitment to objectives, state goal orientation, frustration, off task thoughts, and perceived goal progress. In addition, following the third and ninth trials individuals completed basic and strategic knowledge tests. These measures are presented in Appendix E.

Several measures were also created from data collected by the task. The feedback program designed specifically for use in this study was used to calculate how much time individuals spent viewing their feedback during each block of three trials and in what order they viewed the different types of feedback. This information provides a measure of the extent to which participants engaged in self-evaluation activities, which are an important part of the self-regulatory process. The on-line training manual also recorded

how much time individuals spent studying prior to each trial. The amount of time individuals spent studying during each block of three trials was used as a measure of cognitive effort. Finally, data collected from the TANDEM simulation allowed for an assessment of individuals' overall as well as basic and strategic performance on the near and far transfer trials. All of these measures are described in greater detail below.

Trait goal orientation. Before the experiment, participants completed a version of VandeWalle's (1997) trait goal orientation measure that was modified to be domain-general, instead of specific to the work domain. VandeWalle's (1997) measure is based on a three-factor model of goal orientation, which divides performance orientation into performance-approach orientation and performance-avoid orientation.

The VandeWalle (1997) measure contains 13 items, with responses made on a 6-point scale ranging from "strongly agree" (1) to "strongly disagree" (6). In the current study, these anchors were reversed to create a format consistent with the other measures on the questionnaires. Five items were used to assess learning orientation and performance-prove and performance-avoid orientations were both assessed with 4 items each. Internal consistency reliabilities (coefficient alphas) were .87 for learning orientation, .84 for performance-prove orientation, and .86 for performance-avoid orientation. This measure is presented in Appendix D.

Participants also completed a version of Elliot and McGregor's (2001) trait goal orientation measure that is based on a four-factor model of goal orientation, which divides both performance and mastery orientations into an approach and avoid focus. Both the VandeWalle (1997) and Elliot and McGregor (2001) measure of goal orientation are being used to assess the construct in two different ways.

Elliot and McGregor's (2001) 12-item measure was modified to be task specific due to the focus of this research. All responses were made on a 5-point scale ranging from "strongly disagree" (1) to "strongly agree" (5). Three items were used to assess each of the goal orientations. Internal consistency reliabilities were .73 for mastery-prove orientation, .81 for mastery-avoid orientation, .85 for performance-prove orientation, and .80 for performance-avoid orientation. This measure is presented in Appendix D.

Positive and Negative Affect. Before the experiment, participants completed Watson, Clark, & Tellegen's (1988) measure of positive and negative affect. This measure assessed, in general, how people generally feel on twenty emotions. All items were measured on a 5-point scale ranging from "very slightly or not at all" (1) to "extremely" (5). Coefficient alpha was .75. This measure is presented in Appendix D.

Affect Intensity. Before the experiment, participants completed Larsen and Diener's (1987) measure of affect intensity. This measure assessed emotional reactions to typical life events. All items were measured on a 6-point scale ranging from "never" (1) to "always" (6). Coefficient alpha was .85. This measure is presented in Appendix D.

Action-State Orientation. Before the experiment, participants completed Diefendorff, Hall, Lord, & Strean's (2000) measure of action-state orientation. All items were measured on an ipsative scale where the respondent is given a scenario and forced to choose between responses that indicate either that they would take action in the scenario or that they would respond emotionally. This measure is presented in Appendix D.

Cognitive ability. Cognitive ability was measured by having individuals report their highest score on the SAT or ACT. Individuals were assured that this information would be kept strictly confidential and would be used for research purposes only. In addition, participants were asked to sign a release form that allowed the experimenter to obtain participants' test scores from the Registrar's Office. Scores were only requested from the Registrar when participants gave consent and indicated that they could not remember their score on the SAT or ACT. Researchers generally agree that the SAT and ACT have a large general cognitive ability component (Hunter, 1986; Phillips & Gully, 1997; Schmidt, 1988). Past research using samples from TANDEM studies have also established high correlations between reported SAT/ACT scores and scores on the Wonderlic personnel test. In addition, the publishers of these tests claim high internal consistency reliabilities (e.g., above .80) for their measures. Individuals' ACT or SAT scores were standardized using 1999 norms published by ETS, and this standardized score was used as a measure of cognitive ability. If individuals provided both an ACT and SAT score, the standardized ACT score was used.

Goals. Prior to training blocks 1, 2, and 3, participants were asked to report up to four goals they wished to achieve during this study. The goals will be coded by independent sources at a later date for further exploratory analyses.

Goal commitment. Following the reporting of goals prior to training blocks 1, 2, and 3, participants completed a 7-item measure of goal commitment adapted from Hollenbeck, Klein, O'Leary, and Wright (1989). All items were measured on a 5- point scale ranging from "strongly agree" (1) to "strongly disagree" (5). Coefficient alpha was

.77 prior to training block 1, .86 prior to training block 2, and .86 prior to training block 3. This measure is presented in Appendix E.

Training motivation. Following the reporting of goals prior to training block 1, participants completed a 9-item measure of training motivation adapted from Noe and Schmitt (1986). All items were measured on a 5-point scale ranging from "strongly agree" (1) to "strongly disagree" (5). Coefficient alpha was .87. This measure is presented in Appendix E.

Metacognitive activity. Following the third and ninth trials, participants also completed a 12-item measure of metacognitive activity adapted from Ford et al. (1998). This measure is designed specifically to examine metacognitive activity within the context of the TANDEM task. A few items were modified due to changes in task design and the focus of training. The items included in this measure assess self-monitoring of learning, the planning of learning activities, and the self-evaluation of one's progress. All items were measured on a five-point scale ranging from "never" (1) to "constantly" (5). Coefficient alpha for the metacognitive activity measure was .90 at Time 1 and .93 at Time 2. This measure is presented in Appendix E.

Self-efficacy. Following the third and ninth practice trials, self-efficacy was assessed using an 8-item self-report measure developed for use in this research paradigm (Bell, 1999; Ford et al., 1998; Kozlowski et al.,1996). This measure assessed self-efficacy with a Likert-type scale rather than with ratings of confidence about particular aspects of the task (Hysong & Quinones, 1997; Lee & Bobko, 1994). The construct of self-efficacy is operationalized as a "task-focused, self-perception with item content specifically focused on the capability to cope and to develop methods to effectively deal

with the information, decisions, and challenges of the simulation" (Kozlowski et al., 1996, p. 18). This is consistent with conceptualizations of efficacy as central to self-regulatory processes (Gist & Mitchell, 1992). Response options for this scale ranged from "strongly disagree" (1) to "strongly agree" (5). Internal consistency for this scale was .92 early in training and .95 later in training. This measure is presented in Appendix E.

Frustration. Following the third and ninth practice trials, participants completed a 5-item measure of frustration adapted from Kanfer et al. (1994) scale of negative affect. All items were measured on a 5-point scale ranging from "never" (1) to "always (5). Internal consistency for this scale was .75 early in training and .81 later in training. This measure is presented in Appendix E.

Perceived goal progress. Following the third and ninth practice trials, participants completed a measure of perceived goal progress developed for use in this research study. Using measures from Elliot and Church (1992), Maier and Brunstein (2001), and Alliger and Williams (1993), participants rated their perceptions of how much progress they had made towards their goals on a 5-item measure. All items were rated on a 5-point scale ranging from "strongly disagree" (1) to "strongly agree" (5). Internal consistency for this scale was .87 at Time 1 and .85 at Time 2. This measure is presented in Appendix E.

Off task thoughts. Following the third and ninth practice trials, participants also completed a 7-item measure of off task thoughts adapted from Kanfer et al. (1994). The items were measured on a 5-point scale ranging from "never" (1) to "always" (5). Internal consistency for this scale was .86 early in training and .92 later in training. This measure is presented in Appendix E.

State goal orientation. Participants completed a measure of their state goal orientation following the third and ninth practice trials. These scales were adapted from Elliot and McGregor (2001) to reference their behavior specific to this task. These scales were originally designed as trait measures to assess individuals' general disposition, but for the purposes of the current study, the wording of the items was changed to reference the experimental task and to create a more state-based measure. Similar to trait goal orientation, these scales treat mastery-prove, mastery-avoid, performance-prove, and performance-avoid as separate constructs. The mastery-prove (M-P) scale assesses the degree to which individuals are focused on learning the task and proving competence to themselves. The mastery-avoid (M-A) scale measures the extent to which individuals are interested in learning the task but avoiding failure or misunderstanding what they have learned. The performance-prove (P-P) scale measures the degree to which individuals are focused on obtaining high scores and demonstrating competence to others, while the performance-avoid (P-A) scale assesses the degree to which individuals are focused on avoiding a poor performance and looking incompetent. All 12 items were rated on a 5-point scale ranging from "strongly disagree" (1) to "strongly agree" (5). Alpha levels for the scales were .87 for M-P, .92 for M-A, .91 for P-P, and .78 for P-A at Time 1 and .89, .90, .90, and .81, respectively, at Time 2. This measure is presented in Appendix E.

Commitment to objectives. Following the third and ninth practice trials, participants completed a 7-item measure assessing commitment to their training objectives adapted from Hollenbeck et al. (1989). All items were measured on a 5- point scale ranging from "strongly agree" (1) to "strongly disagree" (5). Coefficient alpha was .83 at Time 1 and .87 at Time 2. This measure is presented in Appendix E.

Basic and strategic knowledge. Basic task knowledge was assessed following the completion of the first and third practice blocks (after trials 3 and 9). Eleven multiple-choice items focusing on the extent to which declarative knowledge about the task had been acquired were utilized, focusing on cue values and basic operating features of the task. This measure is presented in Appendix E. Strategic task knowledge was also assessed following the completion of the first and third training blocks. Eleven multiple-choice items were used that focused on the extent to which strategic knowledge about the task had been acquired. This measure focused on aspects of the game such as locating the outer defensive perimeter and prioritizing targets. This measure is presented in Appendix E. Based on past research using this same measure of basic and strategic knowledge (Bell, 1999; Bell, 2002; Dobbins, 2002), path analysis and confirmatory factor analysis have shown two distinct factors, confirming the a priori factor structure of the two scales.

Cognitive effort. The amount of time each participant spent studying the TAP manual during the study sessions was measured using the computerized TAP manual. Trainees had a maximum of 2.5 minutes before each practice trial during which they could review the computerized manual. The total amount of time spent studying the manual during each training block was calculated and used as a measure of study time. Although trainees were instructed to exit the manual if they finished studying early, some trainees would instead leave the table of contents page on the screen and wait for the manual to automatically exit after 2.5 minutes. As a result, time spent on the table of contents page was not included in the total time spent studying. Only time spent studying pages of the manual that included TAP content was included in total time spent studying.

Cognitive reflection. The feedback program designed specifically for this study measured the amount of time trainees spent on feedback. As trainees scrolled through the feedback, the program recorded the amount of time that the trainee spent on each screen. The time spent on each screen of feedback was summed within each training block to determine the total time spent on feedback.

Basic and strategic performance. Within the task itself, data was collected that allowed assessments to be made of trainees' basic performance and also the extent to which strategies were being utilized in the domains of situational assessment and prioritization of targets. Indicators of a trainee's basic performance were the number of points a trainee gained for correct decisions and the number of points lost for incorrect decisions. These were the two main components of a trainee's score. Score during the training trials was calculated by adding 100 points for each target correctly identified and prosecuted, and subtracting 100 points for each target misidentified or prosecuted incorrectly. The number of outer perimeter intrusions served as the indicator of strategic performance. Strategic situational assessment and target prioritization is captured by the number of outer perimeter intrusions allowed, as defense of the outer perimeter required individuals to zoom out, recognize the invisible perimeter by identifying marker targets, check the speed of targets nearing the perimeter, and to prioritize prosecution of targets to prevent those targets nearest the perimeter from penetrating the perimeter. Time 1 indicators are based on performance in the third training trial, and Time 2 indicators are based on performance in the ninth training trial.

Manipulation check. Prior to the generalization trial, participants completed a measure as a manipulation check for the goal orientation state manipulation that had been

introduced and reinforced throughout the entire session. This measure was created specifically for this study. Using the set of objectives participants were told in the manipulations, a 16-item measure was created that asked participants to what extent they were told the manipulation objectives. Participants rated each item on a 5-point scale ranging from "strongly disagree" (1) to "strongly agree" (5). This measure is presented in Appendix E.

Final training motivation. Participants completed a measure of their final training motivation after the generalization trial. Using a 3-item measure that was developed for use in this study paradigm, participants indicated the degree to which they were generally motivated during the experiment. All items were rated on a 5-point scale ranging from "strongly disagree" (1) to "strongly agree" (5). Coefficient alpha was .83. This measure is presented in Appendix E.

RESULTS

The means, standard deviations, and intercorrelations among all variables included in the analyses described below are provided in Table 1. Below is presented a section describing the nature of the goal states observed and feedback sought as well as the results of a MANCOVA that was used to test the overall and direct effects of the goal manipulations. I then provide the results of RM-MANCOVAs and regression analyses used to test the hypotheses outlined earlier and discuss additional analyses that were used to test the model in more detail. Appendix I presents a summary of the tests of the hypotheses.

Manipulation Check

A MANOVA was conducted on the manipulation check items to ensure that participants were differentially sensitive to their respective manipulated objectives. The MANOVA revealed a significant effect for condition on manipulation check ratings, $F(3, 389) = .13.77$, $p < .001$, $\eta^2 = .55$. Participants in the mastery-approach condition more strongly endorsed the mastery-approach objectives than all other participants, ($M = 4.64$ (M-P), 3.98 (M-A), 3.87 (P-P), and 3.18 (P-A)), mastery-avoid participants more strongly endorsed the mastery-avoid objectives than all other participants ($M = 2.41$ (M-P), 4.45 (M-A), 3.04 (P-P), 3.00 (P-A)), performance-approach participants more strongly endorsed the performance-approach objectives than all other participants ($M = 2.57$ (M-P), 2.89 (M-A), 4.45 (P-P), and 2.91 (P-A)), and performance-avoid participants more strongly endorsed the performance-avoid objectives than all other participants ($M = 1.54$ (M-P), 2.06 (M-A), 1.93 (P-P), and 4.40 (P-A)). These results indicated that participants were differentially sensitive to the objectives contained in the goal manipulations;

therefore, further examination of goal manipulations on feedback content sought was warranted.

Feedback Content: Hypotheses 1-4

To examine the effects of the manipulations on feedback seeking, two MANCOVAs were performed. Cognitive ability, as measured by ACT or SAT score, was treated as a covariate in these and all subsequent analyses. Trait goal orientation was also treated as a covariate, measured by Elliot and McGregor's (2001) four-dimensional scale.[3] Due to the nature of feedback presented, two separate analyses were required to account for the scaling of time in the study as basic/strategic and correct/incorrect feedback served as higher order categories in the way feedback was accessed (e.g., each time a person looked at process (or outcome) feedback, this information was embedded as actions done correctly or incorrectly, as well as related to basic or strategic aspects of the task). Therefore, overall time for basic (or strategic) and correct (or incorrect) feedback was greater than overall time for process (or outcome) and self-referenced (or normative) feedback sought.[4]

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[3] A side by side comparison of trait goal orientation measures was done to compare the predictive validity of Elliot and McGregor's (2001) four-dimensional measure against VandeWalle's (1997) three-dimensional measure. Results demonstrated that both measures were equally predictive of the learning processes and outcomes in this experiment; therefore, the four-dimensional measure was used as an indicator of trait goal orientation to be consistent with the conceptual goal manipulations used in this research.

[4] To assess feedback seeking, total time in the category across 9 training trials was used. Alternative methods of assessing feedback seeking were explored, including time spent only in trials 7-9 (Block 3), instances of feedback seeking (each time an individual selected a category as opposed to the time spent in the category), and a measure of the time spent in one category against all other categories. Time spent only in Block 3 as a measure of feedback seeking mirrored results observed for total time; therefore, to more completely capture feedback seeking over the course of training, total time was used. A measure of feedback instances was also examined as a way to capture individual choices, yet compared to total time, instances did not capture the depth of feedback seeking and reflection that total time was able to denote. Additionally, in computing ratio measures of feedback seeking, comparing mean differences between categories on feedback sought becomes impossible due to the nature of ratio data. Because mean differences in feedback sought, whether between conditions or within groups, is the focus of this research, total time was concluded to be the best measure of feedback sought.

Basic-strategic and correct-incorrect content. A MANCOVA was performed to examine the overall effects that manipulated goals and achievement orientation had on basic-strategic and correct-incorrect feedback seeking. Using goal orientation traits measured prior to the experiment and ability as covariates, the MANCOVA demonstrated a significant overall effect for cognitive ability, $F(3, 384) = 3.424$, $p < .02$, $\eta^2 = .03$. These results suggest that the use of cognitive ability as a covariate is appropriate. However, no effect was observed for any dimensions of trait goal orientation, mastery-approach scale, $F(3, 384) = .245$, $p = ns.$, $\eta^2 = .002$, mastery-avoid scale, $F(3, 384) = 1.008$, $p = ns.$, $\eta^2 = .008$, performance-approach scale, $F(3, 384) = 0.071$, $p = ns.$, $\eta^2 = .001$, or performance-avoid scale, $F(3, 384) = 1.179$, $p = ns.$, $\eta^2 = .009$, on feedback sought. The MANCOVA also demonstrated a significant overall main effect for mastery-performance, $F(3, 384) = 3.392$, $p < .02$, $\eta^2 = .03$, but no effect for approach-avoid orientation, $F(3, 384) = 0.128$, $p = ns.$, $\eta^2 = .001$, on feedback sought between groups. The interaction between mastery-performance and approach-avoid was also not significant, $F(3, 384) = 0.360$, $p = ns.$, $\eta^2 = .003$. A series of dependent groups t-tests were also conducted to examine the within groups effects on content of feedback sought.

Hypotheses 2 and 4. Looking at the direct effects of mastery-performance on feedback seeking, we found a significant main effect for strategic and incorrect feedback, $F(1, 384) = 7.430$, $p < .01$, $\eta^2 = .02$, and $F(1, 384) = 6.482$, $p < .01$, $\eta^2 = .02$, respectively. An analysis of the means showed that mastery-oriented individuals sought more strategic and incorrect feedback than performance oriented individuals. There were no significant effects for approach-avoid orientation on content sought. This provided support for hypothesis 4b, such that mastery-oriented individual sought more strategic feedback than

performance-oriented individuals, but not for hypothesis 2b, since there were no effects for approach or avoidance on correct/incorrect feedback sought. The results of the dependent groups t-tests revealed that approach-oriented individuals sought more correct than incorrect feedback, $t(199) = 8.08$, $p < .001$ (two-tailed), while avoid-oriented individuals also sought more correct than incorrect feedback, $t(192) = 8.59$, $p < .001$ (two-tailed). This provided partial support for hypothesis 2a, such that approach-oriented individuals sought more correct than incorrect feedback, however, avoid-oriented individuals also made these same choices, contrary to what was expected. The results of the dependent groups t-tests also revealed that mastery-oriented individuals sought more basic than strategic feedback, $t(202) = 2.79$, $p < .01$ (two-tailed), and that performance-oriented individuals also sought more basic than strategic feedback, $t(189) = 4.61$, $p < .001$ (two-tailed). This provided partial support for hypothesis 4a, such that performance-oriented individuals sought more basic than strategic feedback, however, mastery-oriented individuals sought feedback in the same way, contrary to what was expected.

Process-outcome and self-referenced-normative content. A MANCOVA was performed to examine the overall effects that manipulated goals and achievement orientation had on process-outcome and self-referenced-normative feedback seeking. Using goal orientation traits measured prior to the experiment and ability as covariates, the MANCOVA demonstrated a significant overall effect for mastery-performance, $F(3, 384) = 3.744$, $p < .01$, $\eta^2 = .04$, and a marginal effect for approach-avoid orientation, $F(3, 384) = 2.247$, $p < .06$, $\eta^2 = .02$. The interaction between mastery-performance and approach-avoid is not significant, however, $F(3, 384) = 0.510$, $p = ns.$, $\eta^2 = .005$. A significant effect was noted for ability $F(3, 384) = 2.590$, $p < .04$, $\eta^2 = .03$, but not for

trait mastery-approach, $F(3, 384) = .856$, p = ns., $\eta^2 = .009$, mastery-avoid, $F(3, 384) = .335$, p = ns., $\eta^2 = .004$, performance-approach, $F(3, 384) = 1.092$, p = ns., $\eta^2 = .01$, or performance-avoid, $F(3, 384) = .910$, p = ns., $\eta^2 = .009$, on feedback sought.

Hypotheses 1 and 3. Looking at the direct effects of mastery-performance on feedback seeking, we found a significant effect for process and self-referenced feedback, $F(1, 384) = 5.391$, $p < .02$, $\eta^2 = .01$, and $F(1, 384) = 8.393$, $p < .01$, $\eta^2 = .02$, respectively. Analysis of the means showed that mastery-oriented individuals sought more process and self-referenced feedback than performance-oriented individuals. Looking at the direct effects of approach-avoid on feedback seeking, a significant main effect for outcome feedback, $F(1, 384) = 4.660$, $p < .03$, $\eta^2 = .01$, was observed. Analysis of the means revealed avoid-oriented individuals sought more outcome feedback than approach-oriented individuals. This provided support for hypothesis 1b and 3b, such that mastery-oriented individual sought more process feedback than performance-oriented individuals, as well as more self-referenced feedback than performance-oriented individuals. The results of the dependent groups t-tests revealed that mastery-oriented individuals sought more process than outcome feedback, $t(202) = 12.76$, $p < .001$ (two-tailed), but that performance-oriented individuals also sought more process than outcome feedback, $t(189) = 11.98$, $p < .001$ (two-tailed). This provided partial support for hypothesis 1a, since mastery-oriented individuals sought more process than outcome feedback, however, performance-oriented individuals also made these same choices, contrary to what was expected. The results of the dependent groups t-tests also revealed that mastery-oriented individuals sought the same amount of self-referenced and normative feedback, $t(202) = -.02$, p = ns. (two-tailed), and that performance-oriented individuals sought more

normative than self-referenced feedback, $t(189) = -3.88$, $p < .001$ (two-tailed). This provided partial support for hypothesis 3a, such that performance-oriented individuals sought more normative than self-referenced feedback, however, mastery-oriented individuals sought equal amounts of self-referenced and normative feedback, contrary to what was expected.

Summary. As expected, mastery-oriented individuals sought more strategic, self-referenced, and process feedback compared to performance-oriented individuals (Figure 3), yet few effects were observed for approach-avoidance motivation on feedback seeking behavior (Figure 4). Additionally, no effects for trait goal orientation on feedback seeking behavior were found. Post-hoc analyses revealed that mastery-avoid learners behaved more like mastery-approach and performance-approach, and less like performance-avoid individuals, when seeking feedback.

Self-Regulatory Processes: Hypotheses 5-9

A RM-MANCOVA was performed to examine the overall effects of manipulated goals on self-regulatory processes. Using goal orientation traits measured prior to the experiment and ability as covariates, the RM-MANCOVA demonstrated a significant overall effect for cognitive ability, $F(5, 380) = 6.66$, $p < .001$, $\eta^2 = .08$. However, no effect was observed for any dimensions of trait goal orientation, whether mastery-approach, $F(5, 380) = .72$, $p = ns.$, $\eta^2 = .009$, mastery-avoid, $F(5, 380) = .75$, $p = ns.$, $\eta^2 = .01$, performance-approach, $F(5, 380) = .42$, $p = ns.$, $\eta^2 = .006$, or performance-avoid, $F(5, 380) = 1.42$, $p = ns.$, $\eta^2 = .02$, on self-regulatory processes. The RM-MANCOVA also demonstrated a significant overall effect for mastery-performance orientation, $F(5, 380) = 3.21$, $p < .01$, $\eta^2 = .04$, but no effect for approach-avoid motivation, $F(5, 380) =$

1.10, p = ns., η^2 = .01, on self-regulatory processes between groups. Mean levels between mastery-, performance-, approach-, and avoid-oriented individuals on self-regulatory processes are displayed in Table 2.

Hypothesis 5. This hypothesis predicted that (a) performance-oriented learners would report higher perceived goal progress than mastery-oriented learners, (b) avoid-oriented learners would report higher perceived goal progress than approach-oriented learners, and (c) that the mastery-performance and approach-avoid dimensions would interact, such that performance-oriented individuals would report high perceived goal progress at all times, while mastery-oriented individuals would report higher perceived goal progress only under an avoid orientation. Looking at the direct effects of mastery-performance on perceived goal progress, we found a significant effect, F(1, 384) = 4.24, p < .04, η^2 = .01, such that performance-oriented learners reported higher goal progress than mastery-oriented learners. Looking at the effects of approach-avoidance on perceived goal progress, there was no difference between approach and avoidance on perceived goal progress, F(1, 384) = .004, p = ns., η^2 = .00. The interaction between mastery-performance and approach-avoid was also non-significant, F(1, 384) = 1.78, p = ns., η^2 = .005. Therefore, support was found for hypothesis 5a, but not for 5b or 5c.

Hypothesis 6. Hypothesis 6 predicted that (a) mastery-oriented learners would report higher frustration than performance-oriented learners, (b) avoid-oriented learners would report higher frustration than approach-oriented learners, and (c) that the mastery-performance and approach-avoid dimensions would interact, such that mastery-oriented individuals would report high frustration at all times, while performance-oriented individuals would report lower frustration only under an avoid orientation. Looking at

the direct effects of mastery-performance on frustration, we found a significant effect, $F(1, 384) = 14.50$, $p < .001$, $\eta^2 = .04$, such that mastery-oriented learners reported higher frustration than performance-oriented learners. Looking at the effects of approach-avoidance on frustration, there was no difference between approach and avoidance on frustration, $F(1, 384) = 1.52$, $p = ns.$, $\eta^2 = .004$. The interaction between mastery-performance and approach-avoid was significant, however, $F(1, 384) = 4.71$, $p < .03$, $\eta^2 = .01$. Analysis of means reveals that mastery-oriented learners, whether approach- or avoid-oriented, reported highest levels of frustration, while performance-avoid learners reported the lowest levels of frustration (Figure 5). Therefore, support was found for hypotheses 6a and 6c, but not for 6b.

Hypothesis 7. This hypothesis suggested that (a) mastery-oriented learners would report higher self-efficacy than performance-oriented learners, (b) approach-oriented learners would report higher self-efficacy than avoid-oriented learners, and (c) that the mastery-performance and approach-avoid dimensions would interact, such that mastery-oriented individuals would report high self-efficacy at all times, while performance-oriented individuals would report high self-efficacy only under an approach orientation. Looking at the direct effects of mastery-performance on self-efficacy, we found a significant effect, $F(1, 384) = 6.30$, $p < .01$, $\eta^2 = .02$, but in the direction opposite what was predicted, such that mastery-oriented learners reported lower self-efficacy than performance-oriented learners. Looking at the effects of approach-avoidance on self-efficacy, there was no difference between approach and avoidance on efficacy, $F(1, 384) = .76$, $p = ns.$, $\eta^2 = .002$. The interaction between mastery-performance and approach-

avoid was also non-significant, $F(1, 384) = 2.21$, p = ns., $\eta^2 = .006$. Therefore, hypotheses 7a, 7b, and 7c are not supported.

Hypothesis 8. Hypothesis 8 suggested that (a) performance-oriented learners would report higher off task thoughts than mastery-oriented learners, (b) avoid-oriented learners would report higher off task thoughts than approach-oriented learners, and (c) that the mastery-performance and approach-avoid dimensions would interact, such that performance-oriented individuals would report high off task thoughts at all times, while mastery-oriented individuals would report high off task thoughts only under an avoid orientation. Looking at the direct effects of mastery-performance on off task thoughts, we found a significant effect, $F(1, 384) = 5.03$, $p < .03$, $\eta^2 = .01$, but in the direction opposite what was predicted, such that mastery-oriented learners reported greater off task thoughts than performance-oriented learners. Looking at the effects of approach-avoidance on off task thoughts, there was no difference between approach and avoidance on off task thoughts, $F(1, 384) = .45$, p = ns., $\eta^2 = .001$. The interaction between mastery-performance and approach-avoid was also non-significant, $F(1,384) = .003$, p = ns., $\eta^2 = .00$. Therefore, hypotheses 8a, 8b, and 8c are not supported.

Hypothesis 9. This hypothesis suggested that (a) mastery-oriented learners would report higher metacognition than performance-oriented learners, and (b) approach-oriented learners would report higher metacognition than avoid-oriented learners. Looking at the direct effects of mastery-performance on metacognition, we did not find a significant effect, $F(1, 384) = .14$, p = ns., $\eta^2 = .00$. Looking at the effects of approach-avoidance on metacognition, there was also no difference between approach and

avoidance, $F(1, 384) = .20$, p = ns., $\eta^2 = .001$. Therefore, hypotheses 9a and 9b are not supported.

Summary. Consistent with expectations, mastery-oriented learners were more frustrated and had less perceived goal progress than performance-oriented learners. Contrary to expectations, mastery-oriented learners reported lower self-efficacy and more off task thoughts than performance-oriented learners. No differences were observed between mastery- and performance-oriented learners on metacognition. No differences were observed for approach or avoidance or trait goal orientation on any self-regulatory processes. Again, post hoc analysis of means showed that mastery-avoid learners responded more like mastery-approach and performance-approach and less like performance-avoid learners on their self-regulatory reactions to learning.

Learning and Performance Outcomes: Hypotheses 10-17

A MANCOVA was performed to examine the overall effects of manipulated goals on learning and performance outcomes. Using goal orientation traits measured prior to the experiment and ability as covariates, the MANCOVA demonstrated a significant overall effect for cognitive ability, $F(9, 376) = 10.47$, $p < .001$, $\eta^2 = .20$. However, no effect was observed for trait mastery-approach, $F(9, 376) = .48$, p = ns., $\eta^2 = .01$, trait mastery-avoid, $F(9, 376) = 0.48$, p = ns., $\eta^2 = .01$, trait performance-approach, $F(9, 376) = 0.74$, p = ns., $\eta^2 = .02$, or trait performance-avoid goal orientation, $F(9, 376) = 0.33$, p = ns., $\eta^2 = .008$, on learning and performance outcomes. The MANCOVA also demonstrated a significant overall effect for mastery-performance orientation, $F(9, 376) = 2.69$, $p < .01$, $\eta^2 = .06$, but no effect for approach-avoid motivation, $F(9, 376) = 0.61$, p = ns., $\eta^2 = .01$, or the interaction between mastery-performance and approach-avoid, F(9,

376) = 0.60, p = ns., η^2 = .01, on learning and performance outcomes between groups. Mean levels between mastery-performance and approach-avoid orientations on learning and performance outcomes are displayed in Table 3.

Hypothesis 10. This hypothesis predicted that (a) mastery-oriented learners would expend more cognitive effort studying the task manual than performance-oriented learners, (b) approach-oriented learners would expend more effort studying than avoid-oriented learners, and (c) that the mastery-performance and approach-avoid dimensions would interact, such that performance-oriented individuals would expend less effort at all times, while mastery-oriented individuals would expend less effort only under an avoid orientation. Looking at the direct effects of mastery-performance on total study effort, we found a significant effect, F(1, 384) = 4.08, p < .04, η^2 = .01, such that mastery-oriented learners did expend more effort studying than performance-oriented learners. Looking at the effects of approach-avoidance on total study effort, there was no difference between approach and avoidance on study effort, F(1, 384) = .01, p = ns., η^2 = .00. The interaction between mastery-performance and approach-avoid was also non-significant, F(1, 384) = .22, p = ns., η^2 = .001. Therefore, support was found for hypothesis 10a, but not for 10b or 10c.

Hypothesis 11. This hypothesis predicted that (a) mastery-oriented learners would spend more effort studying strategic versus basic parts of the task manual, while performance-oriented learners would spend more effort studying basic versus strategic parts of the task manual, and (b) mastery-oriented learners would spend more effort on strategic aspects of the task manual than performance-oriented learners, and performance-oriented individuals would be more likely to spend time on basic parts of

the manual relative to mastery-oriented individuals. A dependent groups t-test was done to examine hypothesis 11a. The results of the dependent groups t-test revealed that mastery-oriented individuals spent more time on basic than strategic parts of the manual, $t(202) = 18.27$, $p < .001$ (two-tailed), and that performance-oriented learners did as well, $t(189) = 17.68$, $p < .001$ (two-tailed). Therefore, only partial support was found for hypothesis 11a. Looking at the direct effects of mastery-performance on effort spent on basic parts of the task manual, a non-significant effect was observed, $F(1, 384) = .008$, p = ns., $\eta^2 = .00$, such that mastery- and performance-oriented learners spent equal time on basic aspects of the task manual. Looking at the direct effects of mastery-performance on effort spent on strategic parts of the task manual revealed a significant effect, $F(1, 384) = 3.77$, $p < .05$, $\eta^2 = .01$, such that mastery-oriented learners spent more time on strategic parts of the task manual than performance-oriented learners. Therefore, partial support was found for hypothesis 11b.

Hypothesis 12. This hypothesis predicted that (a) mastery-oriented learners would spend more time cognitively reflecting on feedback than performance-oriented learners, (b) approach-oriented learners would spend more time cognitively reflecting on feedback than avoid-oriented learners, and (c) that the mastery-performance and approach-avoid dimensions would interact, such that performance-oriented individuals would spend less time reflecting on feedback at all times, while mastery-oriented individuals would spend less time reviewing feedback only under an avoid orientation. Looking at the direct effects of mastery-performance on total feedback time, we found a significant effect, $F(1, 384) = 8.22$, $p < .01$, $\eta^2 = .02$, such that mastery-oriented learners did spend more time reviewing feedback than performance-oriented learners. Looking at the effects of

approach-avoidance on total feedback time, there was no difference between approach and avoidance on total feedback time, $F(1, 384) = .30$, $p = ns.$, $\eta^2 = .001$. The interaction between mastery-performance and approach-avoid was also non-significant, $F(1, 384) = .00$, $p = ns.$, $\eta^2 = .000$. Therefore, support was found for hypothesis 12a, but not for 12b or 12c.

Hypothesis 13. Hypothesis 13 suggested that (a) there will be no differences between mastery- and performance-oriented learners on levels of basic knowledge, and (b) approach-oriented learners would achieve higher basic knowledge than avoid-oriented learners. Looking at the direct effects of mastery-performance on basic knowledge, we found a non-significant effect, $F(1, 384) = .07$, $p = ns.$, $\eta^2 = .00$, such that mastery- and performance-oriented learners obtained equal amounts of basic knowledge. Therefore, support was found for hypothesis 13a. Looking at the effects of approach-avoidance on basic knowledge, there was no difference between approach and avoidance, $F(1, 384) = 1.44$, $p = ns.$, $\eta^2 = .004$. Therefore, hypothesis 13b was not supported.

Hypothesis 14. Hypothesis 14 suggested that (a) mastery-oriented learners would achieve higher strategic knowledge than performance-oriented learners, and (b) approach-oriented learners would achieve higher strategic knowledge than avoid-oriented learners. Looking at the direct effects of mastery-performance on strategic knowledge, we found a non-significant effect, $F(1, 384) = .53$, $p = ns.$, $\eta^2 = .001$, such that mastery and performance-oriented learners obtained equal amounts of strategic knowledge. Therefore, hypothesis 14a was not supported. Looking at the effects of approach-avoidance on strategic knowledge, no differences were observed between approach- and

avoid-oriented individuals, $F(1, 384) = 2.07$, p = ns., $\eta^2 = .001$. Therefore, hypothesis 14b was also not supported.

Hypothesis 15. This hypothesis suggested that (a) there will be no differences between mastery- and performance-oriented learners on levels of basic performance, and (b) approach-oriented learners would achieve higher basic performance than avoid-oriented learners. Looking at the direct effects of mastery-performance on basic performance, we found a significant effect, $F(1, 384) = 6.08$, $p < .01$, $\eta^2 = .02$, such that performance-oriented learners achieved better basic performance than mastery-oriented learners. This was contrary to expectations; therefore, hypothesis 15a was not supported. Looking at the effects of approach-avoidance on basic performance, there was no difference between approach- and avoid-oriented individuals, $F(1, 384) = .32$, p = ns., $\eta^2 = .001$. Therefore, hypothesis 15b was not supported.

Hypothesis 16. Hypothesis 16 suggested that (a) mastery-oriented learners would achieve higher strategic performance than performance-oriented learners, (b) approach-oriented learners would achieve higher strategic performance than avoid-oriented learners, and (c) that the mastery-performance and approach-avoid dimensions would interact, such that performance-oriented individuals would have lower strategic performance regardless of approach- or avoid-orientation, while mastery-oriented individuals would display lower strategic performance only under an avoid motivation. Looking at the direct effects of mastery-performance on strategic performance, we found a significant effect, $F(1, 384) = 4.13$, $p < .05$, $\eta^2 = .01$, such that mastery-oriented individuals did achieve higher strategic performance than performance-oriented learners. Therefore, hypothesis 16a was supported. Looking at the effects of approach-avoidance

on strategic performance, there was no difference between approach and avoidance orientation, $F(1, 384) = 2.18$, $p = ns.$, $\eta^2 = .006$. Therefore, hypothesis 16b was not supported. The interaction between mastery-performance and approach-avoid was also non-significant, $F(1, 384) = .20$, $p = ns.$, $\eta^2 = .001$. Therefore, hypothesis 16c was also not supported.

Hypothesis 17. Hypothesis 17 predicted that (a) mastery-oriented learners would achieve higher generalization performance than performance-oriented learners, (b) approach-oriented learners would achieve higher generalization performance than avoid-oriented learners, and (c) that the mastery-performance and approach-avoid dimensions would interact, such that performance-oriented individuals would have lower generalization performance regardless of approach- or avoid-motivation, while mastery-oriented individuals would display lower generalization performance only under an avoid motivation. Looking at the direct effects of mastery-performance on generalization performance, we found a significant effect, $F(1, 384) = 4.72$, $p < .05$, $\eta^2 = .01$, such that performance-oriented individuals achieved higher generalization performance than mastery-oriented learners. This was contrary to what was expected; therefore, hypothesis 17a was not supported. Looking at the effects of approach-avoidance on generalization performance, there was no difference between approach and avoidance, $F(1, 384) = .08$, $p = ns.$, $\eta^2 = .00$. Therefore, hypothesis 17b was not supported. The interaction between mastery-performance and approach-avoid was also non-significant, $F(1, 384) = .97$, $p = ns.$, $\eta^2 = .003$. Therefore, hypothesis 17c was also not supported.

Summary. In terms of learning and performance outcomes, results demonstrated that mastery-oriented learners spent more time studying the task manual and reflecting on

feedback than performance-oriented learners. No differences between mastery- and performance-oriented learners were seen on levels of basic knowledge, yet performance-oriented learners achieved higher basic performance, which was unexpected. No differences were observed between mastery- and performance-oriented learners on levels of strategic performance, yet mastery-oriented learners achieved higher strategic performance, which was consistent with expectations. However, mastery-oriented individuals achieved lower performance in the generalization trial, which was inconsistent with expectations. Again, no differences were observed between approach- and avoid-oriented learners on any learning or performance outcomes. Analysis of the means revealed that consistent with previous results, mastery-avoid learners behaved more like mastery-approach and performance-approach, and less like performance-avoid learners.

Hypotheses over Time: Hypotheses 18-23

This final set of hypotheses predicted that over the course of training, interactions would be observed between the mastery-performance and approach-avoid dimensions and time, causing the levels of self-regulatory processes and learning and performance outcomes predicted previously to change. Two RM-MANCOVAs were conducted to examine these hypotheses. Results of the RM-MANCOVA assessing the three-way interaction for the self-regulatory processes of perceived goal progress (H18), frustration (H19), self-efficacy (H20), and off task thoughts (H21) revealed a non-significant main effect for time, $F(5, 380) = 0.53$, $p = ns.$, $\eta^2 = .007$, and a non-significant interaction between mastery-performance, approach-avoid, and time, $F(5, 380) = 1.38$, $p = ns.$, $\eta^2 = .02$. However, follow-up tests revealed a significant univariate interaction just for

perceived goal progress, $F(1, 384) = 4.58$, $p < .03$, $\eta^2 = .01$. This hypothesis predicted that there would be a three-way interaction between the mastery-performance and approach-avoid dimension and time, causing the level of perceived goal progress predicted in Hypothesis 5 to change, such that the perceived goal progress of mastery-avoid learners was expected to decrease over time. Rather than perceived goal progress decreasing over time, goal progress for all individuals increased over time, especially for performance-avoid individuals (Figure 6). No additional univariate effects were observed. Therefore, despite finding a significant interaction for hypothesis 18, it revealed a relationship different from that hypothesized, and therefore hypothesis 18, as well as hypotheses 19-21, were not supported.

An additional RM-MANCOVA was conducted to examine the three-way interaction of time, mastery-performance, and approach-avoid on changes in overall time spent studying the task manual (H22) and overall time spent cognitively reflecting on feedback (H23). A main effect for time was observed, $F(16, 369) = 2.79$, $p < .01$, $\eta^2 = .11$, showing that over time, all participants invested less time in reviewing feedback, yet did not differ in amount of time invested in studying the task manual. The three-way interaction revealed a non-significant effect, $F(16, 369) = .74$, $p = ns.$, $\eta^2 = .03$. Follow up tests revealed a significant two-way interaction between time and the mastery-performance dimension on total time spent reviewing feedback, such that over time, despite overall time decreasing, mastery-oriented individuals invest more time reviewing feedback than performance-oriented individuals. Despite this significant two-way interaction, the three-way interactions predicted in hypotheses 22 and 23 were not observed; therefore, hypotheses 22 and 23 were not supported.

Summary. Despite expectations that learners' responses to training would change over time, whether self-regulatory reactions or effort invested in studying the task manual or reviewing feedback, no such changes were observed in the directions hypothesized. The one interaction that was significant was between mastery-performance, approach-avoid, and time on levels of perceived goal progress. Individuals' perceived goal progress did change over time, and rather than the goal progress of mastery-avoid learners decreasing over time, the perceived goal progress of all learners increased over time.

Summary for Hypothesized Relationships

Across feedback content sought, self-regulatory processes, and learning and performance outcomes, generally robust effects were observed for the mastery-performance manipulation, despite the unexpected reversal observed on several self-regulatory processes. Much weaker effects were observed for the approach-avoidance manipulation and any effects due to trait goal orientation. An explanation for these phenomenon will be provided in the discussion. Discounting the hypotheses with null findings specifically for approach and avoidance, 41% of the remaining hypotheses were supported, either with partial or complete support. Of the hypotheses supported, several important results were found, specifically that mastery-oriented individuals, in investing more effort via study and reflection on feedback, achieve better performance than performance-oriented individuals, even though they respond less positively with lower self-efficacy, higher frustration, off task thoughts, and less perceived goal progress. It is possible that the content of feedback sought plays an important role in the relationship between goals and self-regulatory processes and performance; therefore, a set of

supplemental analyses were conducted to examine feedback sought as a mediating variable. Feedback content may intervene to affect how individuals responded to their performance, such that in seeking specific kinds of feedback, individuals' perceptions of their performance were altered. The relationship between the goal manipulations, content of feedback sought, and learning processes and outcomes are explored below.

Supplementary Analyses: Tests for Mediation

To examine the relationship between goal orientation, feedback sought, and the set of self-regulatory processes, learning, performance outcomes, a series of mediated regressions were performed following Baron and Kenny's (1986) and James and Brett's (1984) guidelines for testing mediation.[5] Previous analyses demonstrated strong effects for the mastery-performance manipulation, but not for the approach-avoid manipulation on feedback sought or processes and outcomes; therefore, when testing for mediation, only the mastery-performance dimension of goals will be considered. To establish mediation, first, the goal manipulation must be shown to predict content of feedback sought. Second, the goal manipulation must also be shown to predict the set of self-regulatory processes, learning, and performance outcomes. Third, the goal manipulation-processes/outcomes relationship must be significantly reduced or eliminated after controlling for content of feedback sought.

After partialling the effect of ability, the goal manipulation predicted content of feedback sought, specifically strategic feedback, incorrect feedback, process feedback,

[5] Alternatively, structural equation modeling and path analysis was considered as a way to examine the relationships between goal orientation, feedback content sought, and the set of self-regulatory processes, learning, and performance outcomes. Path analysis is most useful when trying to estimate the effects of latent variables on observed relationships. Because the reliabilities of the measures used in this study were sufficiently high, the latent variable approach is unlikely to give additional information over and above what is shown in regression. Therefore, regression was used to test for mediation.

and self-referenced feedback (Table 4). A composite variable was created from summing the standardized values of each of these feedback types to represent the overall mediating variable. Second, after partialling the effect of ability, the goal manipulation predicted self-efficacy, frustration, off task thoughts, perceived goal progress, overall study effort, study effort on strategic parts of the task manual, basic performance, strategic performance, and generalization performance (Step 2 of Tables 5-13).

Time spent on strategic, incorrect, process, and self-referenced feedback was combined to form a composite variable. Time spent in each of these categories was standardized and then summed to create a composite mediating variable. When controlling for feedback sought, the effect of the goal manipulation on self-efficacy (Table 5), frustration (Table 6), and basic performance (Table 11) was significantly reduced, suggesting partial mediation. The effect of the goal manipulation on overall study effort (Table 9), study effort on strategic parts of the task manual (Table 10), strategic performance (Table 12), and generalization performance (Table 13) was completely reduced when controlling for feedback sought, suggesting full mediation.

Two additional effects were observed, one for perceived goal progress and a second for one for off task thoughts. First, when controlling for the goal manipulation, the relationship between the mediating variable and perceived goal progress was not significant (Table 8), suggesting that content of feedback does not mediate the relationship between the goal manipulation and perceived goal progress. Second, the relationship between the goal manipulation and off task thoughts got stronger when the mediating variable was included in the model (Table 7). Adding the mediator suppressed variance within the goal manipulation, making the proportion of remaining variance

shared with off task thoughts to be larger, and resulting in an increased beta weight observed on the goal manipulation. The magnitude of the increase was not meaningful; however, suggesting that content of feedback did not mediate the relationship between the goal manipulation and off task thoughts.

In addition to looking at feedback content as a composite variable, the individual content areas were investigated separately from one another in the mediating role, to identify which content areas specifically influenced each process, learning, and performance variable. This was done in an attempt to examine any clustering of affective, effort, and performance-related outcomes as they related to the specific feedback types. Specifically, the goal manipulation affected self-efficacy through self-referenced feedback, frustration through incorrect feedback, and basic performance through process and self-referenced feedback. The goal manipulation affected overall study effort through incorrect, strategic, and process feedback, study effort on strategic aspects of the task manual through strategic and process feedback, strategic performance through strategic feedback, and generalization performance through strategic and process feedback (Figure 7).

DISCUSSION

Overview of Premise

As technology gains popular praise and scientific support as a superior method for training delivery and instruction, learners are gaining greater control over their progress in training (Goldstein & Ford, 2002). To understand the rationale behind learner choices, it is useful to turn to goals as the motivation behind learner actions, as well as the reinforcement learners receive via feedback, which can strengthen and enhance self-regulatory processes in learning (Kozlowski, Gully, et al., 2001; VandeWalle & Cummings, 1997; Bandura, 1986, 1991; Locke & Latham, 1990, 1991; Carver & Scheier, 1981, 2000; Karoly, 1993). More broadly, goal setting and self-regulatory behavior are influenced by goal orientation, which traditionally maps goals into a mastery versus performance focus (Nicholls, 1984; Dweck, 1986). Based on individual evaluations of their ability, learners make different choices whether to expend effort on learning and mastery or on demonstrating ability via performance. More recent conceptualizations of goal orientation include an evaluation of ability and consideration of whether the learner wants to approach successful outcomes or avoid failure, as motivation behind learner behavior (Elliot & McGregor, 2001). Based on differences in learner goal orientation, we expected to see differences in learner choices and behavior, specifically focusing on feedback seeking behavior (Kluger & DeNisi, 1996).

Past research on feedback has shown equivocal effects for providing learners with information about their progress, such that feedback can be beneficial, deleterious, or have no effect on performance. To explain these findings, Kluger and DeNisi's (1996) review and meta-analysis of the literature considered the task and ego-orienting aspects

of feedback as an explanation for the positive and negative effects seen on performance. Feedback that directs attention to task-related processes, either motivational or learning processes, has been found to improve performance to the extent that cues within the feedback were clear and appropriately specific. On the other hand, feedback with ego-related cues has been found to direct attention to the self and to withdraw resources away from the task towards other goals more related to the self, which can decrease learning and performance (Butler, 1987; Kluger & DeNisi, 1996). Because cues in feedback can influence which goals a learner will find salient (either task- or ego-focused), it can be very powerful in directing the focus of regulatory resources during learning. In terms of research looking at feedback seeking, with few exceptions, much of this research has been conducted in settings where social costs and benefits are confounded with goal motives (VandeWalle & Cummings, 1997; VandeWalle, Ganesan, Challagalla, & Brown, 2000). For example, despite looking at goal-based motives driving feedback seeking, if to seek feedback an individual needs to request it from their supervisor, professor, or peers, all of which are social sources, goal motives are not the only motivation behind feedback seeking. Therefore, this study attempted to isolate goal based motives from social motives such as impression management, and examine their independent effects on feedback seeking, learning, and performance.

Additionally, the current study used the theoretical foundation of goal orientation to develop conceptual dimensions of feedback that would be useful to individuals with different goals. Past research on feedback seeking has typically looked at feedback seeking in general without considering the content of information that would be most beneficial to learners pursuing different goals (e.g., Levy, Albright, Cawley, & Williams,

1995). Therefore, based on goal orientation, four dimensions of feedback were explored, both as they related to individual goals and also as they influenced learners' reactions to and performance in training. The self-regulatory responses examined here are consistent with those examined in previous research on learning and training, and include self-efficacy, metacognition, frustration, off task thoughts, perceived goal progress, study effort, knowledge, and performance.

Finally, a broader purpose of this study was to examine learner choices in open learning environments, where differences in learner choices could be traced back to their manipulated goal orientation. The approach used to guide learners through this training experience was along the continuum anchored by total learner control and total program control (Tennyson, 1980). On one hand, total control was not placed in the learner's hands, as the time and general sequence of study, practice, and feedback review was predetermined. In an environment with total learner control, learners would have the option to study, practice, or review feedback for as long as desired in the order desired. Traditional conceptualization of learner control is also more focused on the task itself, such that in a truly learner-controlled environment, individuals could manipulate the task and alter their learning trajectory by making the task easier or more difficult, focus on a narrow or broad set of training objectives, and allocate their time as they wished in regards to study, practice, and review of feedback. While this study did not permit learners that degree of freedom, it also did not restrict learner choices completely, as would an experience under total program control (Tennyson et al., 1980). Learners still had to opportunity to select what they would study, the targets they would practice, and the content of feedback they would review, guided by the learning objectives given at the

start of training. While the absolute domain of the task cannot be manipulated here, data is available to understand how the learner framed his or her own environment, and either chose to prosecute the same targets from trial to trial, thereby making the task easier, or chose to prosecute different targets each time, thereby making the task more difficult. Learner goals set at trials 1, 4, and 7 can be examined to understand the breadth and depth of material individuals planned to pursue in the task, and to the extent that the learner did not spend the entire allotted time reviewing the task manual or studying feedback, withdrawal from the task can be assessed. Therefore, to the extent that learners were able to control elements within the task itself, the primary interest was in the choices learners made with respect to feedback and the effects of those choices on self-regulatory processes and learning outcomes.

Induction of Goal States

Analysis of the manipulation check items indicated that participants were able to distinguish the objectives they were given from objectives in other experimental conditions, providing some support that the manipulation was induced. Elements within the task, such as the reinforcement of goals prior to each training trial and elaborated review prior to each training block indicate that the environment was designed to create a strong situation. However, data gathered at times 1 and 2 assessing state goal orientation speaks to the contrary. A RM-MANCOVA using goal orientation traits and ability as covariates revealed no effect between conditions on goal orientation states, $F(12, 375) = 0.50$, $p = ns.$, $\eta^2 = .01$. This is matched with no overall effect for time, $F(4, 381) = 0.54$, $p = ns.$, $\eta^2 = .01$, nor a significant interaction between time and condition, $F(12, 375) = 0.82$, $p = ns.$, $\eta^2 = .01$, on goal orientation states. These results show that the situation in

actuality was weak and that manipulations were not induced. However, on reflection, several key points are worth mentioning. While the goal orientation measures used were consistent with the training objectives employed, the measures themselves could have been too complicated for participants to cognitively understand and respond to in a way that matched their current goal state. It is possible that individuals were experiencing the appropriate state but not able to translate their experience into the exact language mentioned in the goal state items, resulting in what appears to be a weak induction of goal states. A cursory review of the goals individuals set for themselves during training blocks 1, 2, and 3 reveals individuals in the mastery conditions set more goals which were broader in scope as compared to the goals of individuals in the performance conditions, which were fewer in number and more specific to their score. Further exploration of this qualitative data is warranted, given the conflicting results from the manipulation check and goal state items, as an additional assessment of the types of things individuals said they would pursue and work towards during training. Because of the limitations associated with the goal state items used here, learner goals will provide a better measure of participant intentions, which are directly related to the goal state they experienced during this session.

Relationship Between Goal Orientation and Feedback Seeking Behavior

Results demonstrated relationships consistent with hypotheses between mastery- and performance-oriented individuals on feedback seeking, such that mastery-oriented individuals sought more strategic, process, and self-referenced feedback than performance-oriented individuals. Mastery-oriented individuals also sought more incorrect feedback than performance-oriented individuals. Despite not predicting this

originally, the results are consistent from what we would expect from mastery-oriented individuals. In trying to understand their mistakes so they can use them as learning points to improve upon future performance, it is not surprising that mastery-oriented learners would seek out incorrect feedback for this purpose.

Most surprising were the generally null effects observed for approach and avoidance motivation on feedback seeking behavior. Despite observing that avoidance-oriented individuals sought more outcome feedback than approach-oriented individuals, no other differences were found. Looking at feedback seeking behavior, mastery-avoid individuals made choices most similar to mastery-approach and performance-approach individuals and most dissimilar to performance-avoid individuals. From a conceptual standpoint, mastery-avoid goals are difficult to comprehend, as they stand in contrast to what is typically thought of as a "mastery" method of learning. Perhaps individuals who were given mastery-avoid objectives had difficulty determining how to pursue the objectives via practice and feedback, and instead focused on learning all they could and doing their best, which is consistent with mastery-approach and/or performance-approach tactics. It is also possible that individuals given mastery-avoid objectives did try to set goals consistent with the objectives early in training, became frustrated, and changed their course later in training. Future research could look at the goals learners set for themselves and analyze the content to see if learner goals are consistent or inconsistent with the objectives they were asked to adopt.

Second, it is possible that elements of the manipulation were not powerful enough to elicit strong differences between individuals in the approach and avoidance conditions. Approach objectives did encourage individuals to be successful, and avoidance objectives

did focus on avoiding failure, but not to the extent that they would elicit extreme reactions, compared to imposing tangible goals on learners that would more strongly guide behavior. While substantively different from a framing manipulation, a more powerful approach to inducing approach or avoid motivation has used financial rewards, such that approach individuals strive to win money whereas avoid individuals want to avoid losing money (e.g., Losco & Epstein, 1977); with this type of motivational induction, differences in behavior and reactions are seen between individuals motivated by these more salient rewards. Future research on manipulating approach and avoid motivation could explore a blend of these two approaches, such that the consequences for being successful or avoiding failure are more significantly highlighted.

Finally, while an effect was often found for ability on feedback seeking behavior, no effects were seen for individual goal orientation traits on behavior. It is possible that the situational goals, reinforced by feedback, overwhelmed individual differences during training. Future research could examine trait x ability and trait x state interactions to see if traits manifest any effects on feedback sought.

Relationship Between Goal Orientation and Self-Regulatory Processes

Results demonstrated relationships consistent with expectations, such that mastery-oriented individuals were more frustrated and perceived lower goal progress than performance-oriented individuals. Contrary to expectations, mastery-oriented individuals reported lower self-efficacy and more off task thoughts than performance-oriented learners. These results fall in contrast to previous research showing mastery-oriented individuals reacting more positively than performance-oriented individuals in similar situations (Bell & Kozlowski, 2002b). A possible explanation resides in the goal

objectives individuals were asked to adopt. The objectives for mastery-oriented individuals were more broad in scope and perhaps more ambiguous than the objectives given to performance-oriented individuals, because individuals in the mastery condition were focused on learning about the task, whether to strive towards further development or avoid letting their knowledge decline, while the objectives given to performance-oriented individuals were primarily focused on their performance, whether to strive towards a good score or avoid getting a bad score. In terms of the task, it is much more evident how to maximize score than how to effectively learn, develop, and master the task domain, which can explain why mastery-oriented individuals responded more poorly, in terms of their affective processes, to the task. They may have been more frustrated and confused as to what to do, because it was not entirely clear, and therefore experienced more off task thoughts, believed they were not making as much goal progress, and had lower efficacy, as compared to performance-oriented individuals. In future research, it would be interesting to compare these results, where students' goals were self-set, to a condition where goals were imposed on students that were explicit and consistent with goal orientation literature, to see if more specific goals give people needed structure so they respond more positively. Additionally, in seeking more self-referenced and incorrect feedback, mastery-oriented individuals were truly learning how poorly they were doing. Total amount of self-referenced and incorrect feedback sought was positively related to frustration and negatively related to self-efficacy, off task thoughts, and perceived goal progress. The self in the self-referenced feedback was very evident, as it was plainly stated how they performed in the previous trial compared to how they did in the current trial.

No differences were observed between mastery-and performance-oriented learners on metacognition or between approach- and avoid-oriented learners on any self-regulatory processes. Again, post hoc analysis of means showed that mastery-avoid learners responded more like mastery-approach and performance-approach and less like performance-avoid learners on their self-regulatory reactions to learning.

Out of all the interactions hypothesized, the only which was supported was the interaction between mastery-performance and approach-avoid on frustration. Performance-avoid individuals were the least frustrated of all participants. It is possible that performance-avoid individuals withdrew from the task, invested less effort in training, and as a result of their withdrawal of effort, experienced less frustration because they were less invested in performing. This is confirmed in part by performance-avoid individuals investing the least amount of time studying the task manual (M = 18:36, compared to 18:52, 19:00 and 18:20 by mastery-approach, mastery-avoid, and performance-approach, respectively) and reviewing feedback (M = 13:32 minutes, compared to 14:51, 14:36, and 13:41 by mastery-approach, mastery-avoid, and performance-approach, respectively).

Relationship Between Goal Orientation and Learning and Performance Outcomes

Results demonstrated that mastery-oriented learners spent more time studying the task manual and reflecting on feedback than performance-oriented learners. No differences were seen between mastery- and performance-oriented learners on levels of basic knowledge, yet performance-oriented learners achieved higher basic performance, which was unexpected. Mastery learners also achieved higher strategic performance, yet lower performance in the generalization trial. Again, no differences were observed

between approach- and avoid-oriented learners on learning and performance outcomes. Analysis of the means revealed that consistent with previous results, mastery-avoid learners behaved more like mastery-approach and performance-approach, and less like performance-avoid learners.

While mastery-oriented learners responded less positively than performance-oriented learners (e.g., lower efficacy, more frustration), they had better strategic performance. On the surface, individuals responding poorly might be expected to withdraw from the task, and as a consequence demonstrate poor performance as well. However, in this case, mastery learners perform better on strategic aspects of the task. This may be due in part to levels of persistence, such that mastery learners study more and invest more effort in reflecting on feedback, as well as engage in behaviors in the task which indicate they are trying harder (Dweck & Leggett, 1988). To appreciate the effort mastery-oriented learners invest in the task, it is necessary to look beyond trainees' scores. Performance-oriented learners make more correct target decisions than mastery-oriented learners, contributing positively to their score, while mastery-oriented learners make more incorrect target decisions than performance-oriented learners, which subtracts points from their score. This results in lower overall basic performance for mastery-oriented learners. This pattern of behavior persists in the generalization trial as well, such that mastery-oriented learners make more incorrect target decisions than performance-oriented individuals, who make more correct target decisions than mastery-oriented individuals. However, mastery learners also zoom out more often and check the speed of targets approaching the outer perimeter more frequently than performance learners. They also prevent more outer defensive perimeter intrusions in both training and the

generalization trial. Despite perceiving the environment as more challenging, behavioral effort indicates that mastery oriented learners still invest more in their progress, which has ultimate results for strategic performance. To mastery-oriented learners, failure indicates a need to revise current strategies and channel any negative reactions back into the task (Dweck & Leggett, 1988).

It is also important to note that superior performance by performance-oriented learners in basic and generalization aspects of the task is not due to superior knowledge, as both performance- and mastery-oriented individuals achieved equal amounts of both basic and strategic knowledge. For performance-oriented individuals, it is possible that their good performance is due to a more narrow focus on a select group of targets, which they can practice, become proficient at, and continue to correctly prosecute throughout training, while mastery-oriented individuals pursue new targets, with the chance that they may make mistakes. Mastery-oriented individuals continuing this pattern of exploration in the generalization trial would likely see detrimental effects on their score as well. Since performance in the generalization trial is a standardized composite of basic and strategic indicators, including points gained for correct decisions, points lost for incorrect decisions, and number of outer perimeter intrusions allowed, basic elements of performance contribute more to generalization performance than strategic elements. Further consideration of the elements of generalization performance, to incorporate additional strategic elements, may ameliorate this situation.

Mediation Analyses

It appears that the feedback types have different effects on sets of variables, namely self-focused reactions, effort and withdrawal, and performance. Self-focused

reactions are influenced by self-referenced feedback, effort (and/or withdrawal of effort) is influenced primarily by process, incorrect, and strategic feedback, and performance outcomes are influenced primarily via process and strategic feedback. It is also possible that the mastery and performance dimensions of goals operate through these pathways. For example, because mastery learners seek out more of the types of feedback mentioned above, their cognitive and affective reactions to learning are tempered by the feedback they seek, which also has implications for performance. In seeking less incorrect, process, self-referenced, and strategic feedback, performance-oriented learners are not confronted with as complicated a picture of their performance, dwell less on poor aspects of their performance, are not as bogged down as mastery-oriented learners in cognitive reactions to feedback, and therefore respond more positively. However, because they do not push themselves to engage in more difficult and challenging aspects of the task, their strategic and generalization performance suffers. All in all, future research should focus on these different pathways, leading from goals to feedback to outcomes, in attempt to isolate those factors which impact learners differently, whether it is the information they receive about their performance, the amount of time they spend in the task, or even the possible interaction between affective processes which have consequences for learning and performance.

Limitations and Future Directions

Despite expecting to see changes in learners' effort and self-regulatory reactions to learning change over time, no such changes were observed. A main effect for time was only observed for effort, and not for self-regulatory reactions. Due to the nature of the task environment, it is possible that trials 1-3 served as an introductory period where

learners were trying to understand the task, learn basic functionality, and explore to some extent the boundaries of feedback and consequences for task actions. In order to observe changes over time, it is possible that only trials 4-9 should be considered, and the level of learning, performance, and reaction to training at trial 3 should serve as a baseline for future comparison.

There were also no differences observed between approach- and avoid-individuals on the majority of feedback seeking areas, learning reactions, or performance. As mentioned, it is possible that mastery-avoid learners responded more like mastery-approach learners, such that the mastery dimension of goal orientation swamped any effect to be found for mastery-avoidance. Isolating performance individuals from mastery individuals, still no differences are observed between performance-approach and performance-avoid individuals on feedback seeking, learning reactions, or performance. In this task, performance individuals, like mastery individuals, were in a technology-based environment where social costs and benefits for seeking feedback were removed. Performance oriented individuals thrive on social comparison (Elliot, 1999). In removing all aspects of social comparison, a situation may have inadvertently been created where performance-approach and performance-avoid are able to be more similar, rather than dissimilar to each other. Because there is no external source for comparison, performance-oriented individuals can cognitively reframe who they consider to be their normative group because they realize in this task that no one really knows how they are doing. Rather than truly striving to show others how well they are doing or to avoid negative evaluations from others, performance-approach and performance-avoid learners diverge less from each other than expected. Future research can examine a situation

where feedback is more public, such that a normative group is made more salient, but continue to provide feedback through technology so that costs related to impression management still remain inoperative.

Future lines of research can also consider the use of feedback as a manipulation itself. Considering the role of feedback, the use of techniques to induce goal states does not have to be limited to explicit manipulations, but the potential of feedback to induce states as an implicit method should be explored. For example, will individuals given only correct, process, and self-referenced feedback adopt a mastery-approach motivational state during training? Is it possible that to induce particular goal states in individuals, limiting the type of feedback they receive will achieve this objective? Therefore, in conducting research on the role of feedback in learning, it will be important to keep in mind how powerful goal-traits are in the learning domain and whether a learner's behavior is consistent with his or her trait orientation, or whether feedback seeking induces a different kind of learning state. Is it possible that learning states change in predictable ways based on the feedback sought? Do individuals with particular traits only look at specific types of feedback, to the exclusion of other types, or do they explore and look at all types of feedback? All of these questions offer new avenues for research and would broaden current understanding of feedback seeking.

Further consideration of the type of manipulation employed, whether a framing or more powerful manipulation of goals, is valuable when attempting to examine the viability of the four-fold classification of goals in this type of experimental setting. In order for performance individuals to truly differentiate from mastery individuals (and even within performance orientation, such that performance-approach and performance-

avoid individuals are also differentiated) some element of social comparison must be available. Without it, performance-oriented individuals may have difficulty knowing to whom their performance is being compared. Continuing to highlight the self-comparison for mastery individuals would remain an important component of the manipulation, and to some extent, emphasizing more clearly what it means to be "mastery-avoid." In novel environments where the focus is on skill acquisition, the expectation is that anyone entering the environment does not possess the skills to be an expert on the given task. Because mastery-avoid individuals are concerned with avoiding mistakes and focused on maintaining their level of knowledge and skills, it may be more difficult to observe differences between mastery-approach and mastery-avoid individuals early in skill acquisition, since neither group has obtained the skills to the point where they can maintain a high level of skill and not let their knowledge and performance decline. Essentially, mastery-avoid individuals focus their energy on building their knowledge and are not yet concerned with letting what little knowledge they have deteriorate or decay.

In addition, issues associated with the use of a verbal framing manipulation were present in the current study. As mentioned, conflicting evidence between the manipulation check and goal state items regarding the extent to which goal states were induced is problematic. Simply telling participants which aspects of the task to focus on was, in hindsight, a weak approach to inducing goals. This is especially true as trainees entered the environment without any knowledge of the task, but their first introduction to the task was to understand the training objectives and rely on them to guide their choices in the task. Because the manipulation was so dependent on elements within the task, it is

very possible that individuals did not understand or buy into the training objectives and instead chose a path that was somewhat consistent with what they were being asked to do and partially consistent with what they perceived as the best approach to the situation. A more general manipulation which presents the training situation as one of remediation versus an opportunity for learning and development may have induced the same desired end state, with individuals being motivated to learn, perform, approach success, and/or avoid failure, but with a different tactic that was more believable from the participant's point of view. As future research endeavors to manipulate goal states, it is important to associate the manipulations with something the trainees can believe and relate to, and to the extent possible, present individuals with a better understanding of what will happen if they comply with or fail to adhere to the training demands. This can come in the form of an explanation of the benefits of a particular approach to training, if learners are to be motivated in a positive way, or the disadvantages of not complying with a particular approach and the possibility that learners will experience negative outcomes. Therefore, in concert with the issues associated with manipulating mastery and performance orientation, consideration of the appropriate methods to manipulate approach, avoidance, and the entire 2 x 2 goal typology, whether more salient and realistic objectives need to be emphasized, tangible rewards (or punishments) imposed, or more specific goals given to learners, warrants further attention.

Conclusions

This model builds on the suggestion by Kluger and DeNisi (1996) that the equivocal effects of feedback interventions may be due to the fact that feedback can have task- or ego-orienting properties, and on prior feedback seeking work that examines the

effects of goal orientations on choices to seek performance feedback from social sources (e.g., VandeWalle & Cummings, 1997; VandeWalle et al., 2000). With the rise of technology-based, more open, learner-centered systems the issue is shifted from one of feedback provision to one of learner feedback selection (Kozlowski, Toney, et al., 2001). What types of feedback will learners choose to seek? How much attention will they devote to their feedback choices, and how will their choices influence – either positively or negatively – learning processes and outcomes? Addressing such concerns more explicitly is the basis for this thesis and future research looking at the relationship between goals, feedback seeking, and self-regulation.

APPENDIX A

Electronic Informed Consent for On-line Questionnaire

Project Title:	Tactical Action Project
Investigators' Names:	Jaclyn Nowakowski & Steve Kozlowski, Ph.D.
Description and Explanation of Procedure:	This study is about computer-based training. The study has two parts. In the first part of the experiment, you will be asked to fill out a a questionnaire on the psychology subject pool web site. In the second part of the experiment you will go to room 4 Snyder Hall and participate in a computer simulation. This consent form relates to the first part of the research study. If you agree to participate in the first part of the research, you will be asked to fill out an online questionnaire, which will take about 30 minutes. It includes questions about your demographic information and other variables related to the computer simulation you will operate if you agree to participate in the second part of the research study. You will also answer questions during the second part of the study which include reporting your SAT or ACT score, answering questions about your task knowledge, and about your performance.
Estimated time required:	30 minutes
Risks and discomforts:	None
Benefits:	You will gain experience completing several standard psychological measures. In addition, you will gain experience completing these measures on-line, a format used by more and more organizations. Finally, you will learn about the process of conducting psychological research.

You have been fully informed of the above-described procedure with its possible benefits and risks. You will be able to view your responses at a later date and be fully debriefed on them if you so desire. The investigators will be available to answer any questions you may have. If, at any time, you feel your questions have not been adequately answered or you want to discuss the research, please contact the experimenter (Jaclyn Nowakowski, 355-2171) or the Head of the Department of Psychology (Neal Schmitt, 353-9563). If you have questions regarding your role and rights as a subject of research, you may contact Ashir Kumar, chair of the University Committee on Research Involving Human Subjects (355-2180), separate from anyone involved in conducting this research project. You are free to withdraw this consent and discontinue participation in this project at any time without penalty. If you choose not to participate in this study, alternatives are available from the subject pool for you to earn credit. If you choose to withdraw from the study prior to its completion, you will receive credit for the time you have spent in the study. Within one year of your participation, a copy of this consent form will be provided to you upon request.

If you agree to participate, you will be asked to type your name at the bottom of this form. The reason you are asked for your name is to ensure that you receive credit for participating in the study. Your name will not be associated with your responses, and will be kept confidential. Your privacy will be protected to the maximum extent allowable by law.

Submitting your answers to this online questionnaire indicates your voluntary agreement to participate.

APPENDIX B

Informed Consent for the Tactical Action Project

Project Title:	Tactical Action Project
Investigators' Names:	Jaclyn Nowakowski & Steve Kozlowski, Ph.D.
Description and Explanation of Procedure:	This study examines your learning and performance on a radar control simulation. In this study, you will be trained to operate a radar control simulation and will have a chance to practice in a number trials. Using the computer-mouse, you will assess the attributes of targets that appear on your screen and decide what actions should be taken for each contact. You will also be asked to provide your SAT or ACT score, answer questions about your performance, and about your learning. You will receive six credits for participation in this study. In addition, you may receive cash awards based on level of knowledge and performance. Additional information on the awards is provided on the prize sheet included in this folder. Winners will be determined at the end of the semester and will be contacted so they can claim their prize.
Estimated time required:	3 ½ hours
Risks and discomforts:	None
Benefits:	You will gain experience in a realistic, computer-based training environment. This can be valuable as more and more organizations use computer-based training to teach various knowledge and skills. In addition, you will learn about the process of conducting psychological research.

You have been fully informed of the above-described procedure with its possible benefits and risks. You will be able to view your responses at a later date and be fully debriefed on them if you so desire. The investigators will be available to answer any questions you may have. If, at any time, you feel your questions have not been adequately answered or you want to discuss the research, please contact the experimenter (Jaclyn Nowakowski, 355-2171) or the Head of the Department of Psychology (Neal Schmitt, 353-9563). If you have questions regarding your role and rights as a subject of research, you may contact Ashir Kumar, chair of the University Committee on Research Involving Human Subjects (355-2180), separate from anyone involved in conducting this research project. You are free to withdraw this consent and discontinue participation in this project at any time without penalty. . If you choose not to participate in this study, alternatives are available from the subject pool for you to earn credit. If you choose to withdraw from the study prior to its completion, you will receive credit for the time you have spent in the study. Within one year of your participation, a copy of this consent form will be provided to you upon request.

If you agree to participate, please sign your name at the bottom of this form. We also ask for your e-mail address and phone number so that we can contact you if you win a prize. It is important to recognize that you will be given a subject number for this experiment. The purpose of this subject number is to keep track of the various materials you will complete during the experiment. Your name will not be associated with your responses and all information you give us will be kept confidential.

Your signature below indicates your voluntary agreement to participate.

Name: _____ Date: _____

Signature: _____ Email: _____

Phone: _____

APPENDIX C

SAT/ACT Form

Please report your SAT and/or ACT scores below. If you do not remember your scores, signing your name at the bottom of this page gives the researchers permission to contact the MSU Registrar's Office to obtain this information. If you do not wish for us to obtain your scores, you do not need to sign the bottom of this form. Your name will not be associated with your scores and all information you give us will be kept confidential.

SAT _____

ACT _____

Your signature below indicates your voluntary agreement to release this information to the researchers of the Tactical Action Project and/or for the researchers to contact the Registrar's office to obtain this information.

Name: _____ Date: _____

APPENDIX D

Measures Prior to Experiment

VandeWalle (1997) Trait Goal Orientation Measure

This set of questions asks you describe your general work orientation. Please make your ratings by clicking on one of the buttons below each question.

1	2	3	4	5	6
Strongly Disagree	Moderately Disagree	Slightly Disagree	Slightly Agree	Moderately Agree	Strongly Agree

1. I am willing to select a challenging assignment that I can learn a lot from.
2. I often look for opportunities to develop new skills and knowledge.
3. I enjoy challenging and difficult tasks where I'll learn new skills.
4. For me, development of my ability is important enough to take risks.
5. I prefer situations that require a high level of ability and talent.
6. I'm concerned with showing that I can perform better than others.
7. I try to figure out what it takes to prove my ability to others.
8. I enjoy it when others are aware of how well I am doing.
9. I prefer projects where I can prove my ability to others.
10. I would avoid taking on a new task if there were a chance that I would appear rather incompetent to others.
11. Avoiding a show of low ability is more important to me than learning a new skill.
12. I'm concerned about taking on a task at work if my performance would reveal that I had low ability.
13. I prefer to avoid situations where I might perform poorly.

Elliot and McGregor (2001) Trait Goal Orientation Measure

This set of questions asks you to describe your task orientation. Please make your ratings by clicking on one of the buttons below each question.

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree

14. It is generally important for me to do better than other people on new tasks.
15. It is generally important for me to do well compared to other people on new tasks.
16. My usual goal is to do better than other people on new tasks.

17. I often worry that I may not learn all that I possibly could about new tasks.
18. I'm frequently afraid that I may not understand new tasks as thoroughly as I'd like.
19. I am often concerned that I may not learn all there is to learn about new tasks.
20. I usually want to learn as much as possible from new tasks.
21. It is generally important for me to understand new tasks as thoroughly as possible.
22. I usually desire to completely master new tasks.
23. Generally, I just want to avoid doing poorly compared to others on new tasks.
24. My usual goal on new tasks is to avoid performing poorly compared to others.
25. My fear of performing poorly compared to others on new tasks is frequently what motivates me.

Watson, Clark, & Tellegen (1988) Positive and Negative Affect Scale

This scale consists of a number of words that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. Indicate to what extent you ***generally*** feel this way, that is, how you feel on average. Use the following scale to make your ratings:

1	**2**	**3**	**4**	**5**
Very Slightly Or Not at All	A Little	Moderately	Quite a Bit	Extremely

26. Interested
27. Distressed
28. Excited
29. Upset
30. Strong
31. Guilty
32. Scared
33. Hostile
34. Enthusiastic
35. Proud
36. Irritable
37. Alert
38. Ashamed
39. Inspired
40. Nervous
41. Determined
42. Attentive
43. Jittery
44. Active
45. Afraid

Larsen and Diener (1987) Affect Intensity Measure

The following questions refer to the emotional reactions to typical life events. Please indicate how you react to these events by marking your answer in the space preceding each item. Please base your answers on how you react, not on how you think others react or how you think a person should react.

1	2	3	4	5	6
Never	Almost Never	Occasionally	Usually	Almost Always	Always

46. When I accomplish something difficult I feel delighted or elated.
47. When I feel happy it is a strong type of exuberance.
48. I enjoy being with people very much.
49. I feel pretty bad when I tell a lie.
50. When I solve a personal problem, I feel euphoric.
51. My emotions tend to be more intense than those of most people.
52. My happy moods are so strong that I feel like I'm "in heaven."
53. I get overly enthusiastic.
54. If I complete a task I thought was impossible, I am ecstatic.
55. My heart races at the anticipation of some exciting event.
56. Sad movies deeply touch me.
57. When I'm happy it's a feeling of being untroubled and content rather than being zestful and aroused.
58. When I talk in front of a group for the first time my voice gets shaky and my heart races.
59. When something good happens, I am usually much more jubilant than others.
60. My friends might say I'm emotional.
61. The memories I like the most are of those times when I felt content and peaceful rather than zestful and enthusiastic.
62. The sight of someone who is hurt badly affects me strongly.
63. When I'm feeling well it's easy for me to go from being in a good mood to being really joyful.
64. "Calm and cool" could easily describe me.
65. When I'm happy I feel like I'm bursting with joy.
66. Seeing a picture of some violent car accident in a newspaper makes me feel sick to my stomach.
67. When I'm happy I feel very energetic.
68. When I receive an award I become overjoyed.
69. When I succeed at something, my reaction is calm contentment.
70. When I do something wrong I have strong feelings of shame and guilt.
71. I can remain calm even on the most trying days.
72. When things are going good I feel "on top of the world."
73. When I get angry it's easy for me to still be rational and not overreact.
74. When I know I have done something very well, I feel relaxed and content rather than excited and elated.

75. When I do feel anxiety it is normally very strong.
76. My negative moods are mild in intensity.
77. When I am excited over something I want to share my feelings with everyone.
78. When I feel happiness, it is a quiet type of contentment.
79. My friends would probably say I'm a tense or "high-strung" person.
80. When I'm happy I bubble over with energy.
81. When I feel guilty, this emotion is quite strong.
82. I would characterize my happy moods as closer to contentment than to joy.
83. When someone compliments me, I get so happy I could "burst."
84. When I am nervous I get shaky all over.
85. When I am happy the feeling is more like contentment and inner calm than one of exhilaration and excitement.

Diefendorff, Hall, Lord, & Strean (2000) Action-State Orientation

Please read the following questions. For each question mark either the first or second choice, whichever is more characteristic of your own behavior, not on how you think others react or how you think a person should react.

86. When I have lost something that is very valuable to me and I can't find it anywhere:
    A. I have a hard time concentrating on something else
    B. I put it out of my mind after a little while

87. When I know I must finish something soon:
    A. I have to push myself to get started
    B. I find it easy to get it done and over with

88. If I've worked for weeks on one project and then everything goes completely wrong with the project:
    A. It takes me a long time to adjust myself to it
    B. It bothers me for a while, but then I don't think about it anymore

89. When I have learned a new and interesting game:
    A. I quickly get tired of it and do something else
    B. I can really get into it for a long time

90. When I don't have anything in particular to do and I am getting bored:
    A. I have trouble getting up enough energy to do anything at all
    B. I quickly find something to do

91. When I'm working on something that's important to me:
    A. I still like to do other things in between working on it
    B. I get into it so much that I can work on it for a long time

92. When I'm in a competition and have lost every time:
    A. I can soon put losing out of my mind

B. The thought that I lost keeps running through my mind

93. When I am getting ready to tackle a difficult problem:
    A. It feels like I am facing a big mountain that I don't think I can climb
    B. I look for a way that the problem can be approached in a suitable manner

94. When I'm watching a really good movie:
    A. I get so involved in the film that I don't even think of doing anything else
    B. I often want to get something else to do while I'm watching the movie

95. If I had just bought a new piece of equipment (for example a DVD player) and it accidentally fell on the floor and was damaged beyond repair:
    A. I would manage to get over it quickly
    B. It would take me a long time to get over it

96. When I have to solve a difficult problem:
    A. I usually don't have a problem getting started on it
    B. I have trouble sorting things out in my head so that I can get down to working on the problem

97. When I have been busy for a long time doing something interesting (for example, reading a book or working on a project):
    A. I sometimes think about whether what I'm doing is really worthwhile
    B. I usually get so involved in what I'm doing that I never think to ask whether it's worthwhile

98. If I have to talk to someone about something important and, repeatedly, can't find him or her at home:
    A. I can't stop thinking about it, even while I'm doing something else
    B. I easily forget about it until I see the person

99. When I have to make up my mind about what I am going to do when I get some unexpected free time:
    A. It takes me a long time to decide what I should do during this free time
    B. I can usually decide on something to do without having to think over it very much

100. When I read an article in the newspaper that interests me:
    A. I usually remain so interested in the article that I read the entire article
    B. I still often skip to another article before I've finished the first one

101. When I've bought a lot of stuff at the store and realize when I get home that I've paid too much but I can't get my money back:
    A. I can't usually concentrate on anything else
    B. I easily forget about it

102. When I have work to do at home:
    A. It is often hard for me to get the work done
    B. I usually get it done right away

103. When I'm on vacation and having a good time:
    A. After a while, I really feel like doing something completely different
    B. I don't even think about doing anything else until the end of vacation

104. When I am told that my work has been completely unsatisfactory:
    A. I don't let it bother me for too long
    B. I feel paralyzed

105. When I have a lot of important things to do and they must all be done soon:
    A. I often don't know where to begin
    B. I find it easy to make a plan and stick with it

106. When one of my coworkers brings up an interesting topic for discussion:
    A. It can easily develop into a long conversation
    B. I soon lose interest and want to go do something else

107. If I'm stuck in traffic and miss an important appointment:
    A. At first, it's difficult for me to start to do anything else at all
    B. I quickly forget about it and do something else

108. When there are tow things that I really want to do, but I can't do both of them:
    A. I quickly begin one thing and forget about the other thing I couldn't do
    B. It's not easy for me to put the other thing I couldn't do out of my mind

109. When I am busy working on an interesting project:
    A. I need to take frequent breaks and work on other projects
    B. I can keep working on the same project for a long time

110. When something is very important to me, but I can't seem to get it right:
    A. I gradually lose heart
    B. I just forget about it and do something else

111. When I have to take care of something important which is also unpleasant:
    A. I do it and get it over with
    B. It can take a while before I can bring myself to do it

112. When I am having an interesting conversation with someone at a party:
    A. I can talk to him or her the entire evening
    B. I prefer to go do something else after a while

113. When something really gets me down:
    A. I have trouble doing anything at all
    B. I find it easy to distract myself by doing other things

114. When I am facing a big project that has to be done:
    A. I often spend too long thinking about where I should begin
    B. I don't have any problems getting started

115. When it turns out that I am much better at a game than the other players:
    A. I usually feel like doing something else
    B. I really like to keep playing

116. When several things go wrong on the same day:
    A. I usually don't know how to deal with it
    B. I just keep on going as though nothing had happened

117. When I have a boring assignment:
    A. I usually don't have any problem getting through it
    B. I sometimes can't get moving on it

118. When I read something I find interesting:
    A. I sometimes still want to put the article down and do something else
    B. I will sit and read the article for a long time

119. When I have put all my effort into doing a really good job on something and the whole thing doesn't work out:
    A. I don't have too much difficulty starting something else
    B. I have trouble doing anything else at all

120. When I have an obligation to do something that is boring and uninteresting:
    A. I do it and get it over with
    B. It can take a while before I can bring myself to do it

121. When I am trying to learn something new that I want to learn:
    A. I'll keep at it for a long time
    B. I often feel like I need to take a break and go do something else for a while

<u>Demographics</u>

122. What is your gender?
    (1) Male (2) Female

123. What is your age?
    (1) <18 years (2) 18-19 years (3) 20-21 years (4) 22-23 years (5) >23 years

124. What is your overall grade point average?
(1) 0-1.0 (2) 1.1-2.0 (3) 2.1-3.0 (4) 3.1-4.0 (5) >4.0

125. Do you play with video games?
(1) Never (2) Rarely (3) Sometimes (4) Frequently (5) Always

APPENDIX E

Measures During Experiment

Task Goals (prior to Blocks 1, 2, and 3)

Please write in your goals that you wish to achieve during this study.

1. _____
   _____
2. _____
   _____
3. _____
   _____
4. _____
   _____

Hollenbeck, Klein, O'Leary, & Wright (1989) Goal Commitment

This set of questions asks you to rate your commitment to the goals you have made for yourself during this study. Please use the scale shown below to make your ratings.

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree

1. It's hard for me to take my goals seriously.
2. It's unrealistic for me to expect to reach my goals.
3. It is quite likely that my goals may need to be revised, depending on how things go.
4. Quite frankly, I don't care if I achieve my goals or not.
5. I am strongly committed to pursuing my goals.
6. It wouldn't take much for me to abandon my goals.
7. I think my goals are good goals to shoot for.

Training Motivation

Please answer the following questions about the training program you will participate in today. Use the following rating scale to indicate your agreement with each of the following statements:

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree

8. I am motivated to learn the skills emphasized in the training program.
9. I will try to learn as much as I can from this training program.
10. I will get more from this training program than most people.
11. I signed up for this experiment as soon as I could.
12. If I can't understand some part of the training I will try harder
13. I will put a lot of effort into doing well in the training program.
14. My primary goal for this experiment is just to finish it so I get my credit.
15. I am excited about the opportunity to participate in this experiment.
16. I am looking forward to learning how to perform this task.

Self-Efficacy

This set of questions asks you to describe how you feel about your capabilities for performing the simulation. Please use the scale shown below to make your ratings.

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree

17. I can meet the challenges of this simulation.
18. I am confident in my understanding of how information cues are related to decisions.
19. I can deal with decisions under ambiguous conditions.
20. I am certain that I can manage the requirements of this task.
21. I believe that I will fare well in this task if the workload is increased.
22. I am confident that I can cope with this simulation if it becomes more complex.
23. I believe I can develop methods to handle changing aspects of this task
24. I am certain I can cope with task components competing for my time.

Metacognitive Activity

For each of the items below, rate the extent to which you were thinking about these issues during the practice sessions. Please use the scale below to make your ratings and make your ratings on the scantron sheet.

1	2	3	4	5
Never	Rarely	Sometimes	Frequently	Always

25. While practicing the simulation, I monitored how well I was learning the requirements.
26. I thought carefully about my performance on the previous trial before selecting what to study and practice.
27. As I performed in the practice trials, I evaluated how well I was learning the skills of the simulation.
28. When my methods were not successful, I experimented with different procedures for performing the task.

29. I considered the skills that needed the most work when choosing what to study and practice.
30. I tried to monitor closely the areas where I needed the most study and practice.
31. I noticed where I made the most mistakes during practice and focused on improving those areas.
32. I carefully determined what to study and practice in order to improve on weaknesses identified in previous trials.
33. I used my performance on the previous trial to revise how I would approach the task on the next trial.
34. I thought about new strategies for improving my performance.
35. I thought ahead to what I would do next to improve my performance.
36. I told myself things to encourage me to try harder.

Kanfer et al. (1994) Frustration and Off Task Thoughts

For each of the items below, rate the extent to which you were thinking about these issues during the past set of practice trials.

1	2	3	4	5
Never	Rarely	Sometimes	Frequently	Always

37. I became frustrated with my inability to improve my performance.
38. I thought about how poorly I was doing.
39. I was satisfied with my overall performance.
40. I got mad at myself during the task.
41. I wanted to give up.

42. I took "mental breaks" during the task.
43. I daydreamed while doing the task.
44. I lost interest in the task for short periods.
45. I thought about other things I have to do.
46. I did not focus my total attention on the task.
47. I thought about the difficulty of the task.
48. I thought about other things that have happened in the past few days.

State Goal Orientation (adapted from Elliot & McGregor, 2001)

This set of items asks you a few questions about the task and your feelings throughout training. Please use the scale shown below to make your ratings.

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree

49. It is important for me to do better than other people on this task.
50. It is important for me to do well compared to other people on this task.
51. My goal is to do better than other people on this task.
52. I am worried that I may not learn all that I possibly could about this task.
53. I am afraid that I may not understand this task as thoroughly as I'd like.
54. I am concerned that I may not learn all there is to learn about this task.
55. I want to learn as much as possible from this task.
56. It is important for me to understand this task as thoroughly as possible.
57. I want to completely master this task.
58. I just want to avoid doing poorly compared to others on this task.
59. My goal on this task is to avoid performing poorly compared to others.
60. My fear of performing poorly compared to others on this task is motivating me.

Goal Progress

Think about the goals you've set for yourself on this task and answer the following questions using the scale below.

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree

61. I have been making progress toward the specific goals I set for myself.
62. I have been doing things that are helping me make progress towards my goals.
63. I have made a great deal of progress concerning my goals.
64. Many things have happened that have obstructed progress towards my goals.
65. I am not making adequate progress toward my goals.

Commitment to Objectives

This set of questions asks you to rate your commitment to the objectives you've been asked to focus on today. Thinking about these objectives, please use the scale shown below to make your ratings.

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree

66. It's hard for me to take my objectives seriously.
67. It's unrealistic for me to expect to reach my objectives.
68. It is quite likely that my objectives may need to be revised, depending on how things go.
69. Quite frankly, I don't care if I achieve my objectives or not.
70. I am strongly committed to pursuing my objectives.
71. It wouldn't take much for me to abandon my objectives.
72. I think my objectives are good objectives to shoot for.

Task Knowledge

The following is a knowledge test about the simulation. Please use the scantron sheet to answer the following questions. Bubble in the correct **letter** for each question, making sure the question numbers match the answer spaces on your scantron sheet.

73. If a Response is Given, what is the likely Intent of the target?

a. Military
b. Hostile
c. Civilian
d. Peaceful

74. A submarine may have which of the following characteristics?

a. Speed 30 knots, Altitude/Depth –20, Communication time 85 seconds.
b. Speed 30 knots, Altitude/Depth 0, Communication time 30 seconds.
c. Speed 20 knots, Altitude/Depth 0, Communication time 80 seconds.
d. Speed 20 knots, Altitude/Depth –20, Communication time 90 seconds.

75. A Maneuvering Pattern of Code Delta indicates the target is which of the following?

a. Air
b. Military
c. Surface
d. Civilian

76. A Blue Lagoon Direction of Origin indicates the target is which of the following?

a. Unknown
b. Sub
c. Civilian
d. Military

77. If a target's Altitude/Depth is 10 feet, what is the Type of the target?

a. Air
b. Surface
c. Submarine
d. Unknown

78. If a target's Intelligence is Unavailable, what Class does this suggest for the target?

a. Air
b. Civilian
c. Military
d. Unknown

79. If a target's characteristics are Communication Time = 20 seconds and Speed = 50 knots, which of the following actions should you take?

a. Choose Intent is Peaceful
b. Choose Type is Surface
c. Get another piece of information
d. Choose Type is Air

80. A Communication Time of 52 seconds indicates that the target is likely:

a. Air
b. Surface
c. Submarine
d. Unknown

81. If a target's characteristics are Intelligence is Private and Maneuvering Pattern is Code Foxtrot, which of the following actions should you take?

a. Choose Class is Military
b. Choose Intent is Peaceful
c. Choose Class is Civilian
d. Choose Intent is Unknown

82. If a target's Maneuvering Pattern is Code Echo, this suggests that the target falls into which category?

a. Class is unknown.
b. Class is Military
c. Class is Hostile
d. Class is Peaceful

83. If a target's Speed is 40 knots, what does this suggest about the target?

a. The target is Air.
b. The target is Surface.
c. The target is Civilian
d. The target is Military.

84. Your Outer Defensive Perimeter is located at:

a. 64 nm
b. 128 nm
c. 256 nm
d. 512 nm

85. If you've just noticed three targets near your inner perimeter, which of the following should you do next?

a. Engage the target nearest the inner perimeter.
b. Engage the fastest target near the inner perimeter.
c. Zoom-Out to check the outer perimeter.
d. Zoom-In to check how close targets are to the inner perimeter.

86. If you Zoom-Out to find three targets clustered around your Outer Perimeter, how would you determine which target is the marker target?

a. Check to see which target is closest to the outer perimeter.
b. Check the speeds of the targets
c. Check to see which target is Civilian
d. Check to see which target is Hostile

87. What is the purpose of marker targets?

a. To determine which Targets are Hostile and which are Peaceful.
b. To locate your Inner Defensive Perimeter.
c. To quickly determine the speeds of targets near your perimeters.
d. To locate your Outer Defensive Perimeter.

88. Which of the following pieces of information is NOT useful for prioritizing targets?

a. The distance of targets from the outer defensive perimeter.
b. Whether the target is peaceful or hostile.
c. The distance of targets from the inner defensive perimeter.
d. The speed of targets near your inner and outer defensive perimeters.

89. Which of the following functions is most useful for identifying marker targets?

a. Zoom-in
b. Right-button feedback.
c. Engage Shoot or Clear
d. Zoom-out

90. If three Targets are about 10 miles outside your outer defensive perimeter, which of the following should you do to prioritize the Targets?

a. Engage the fastest Target
b. Engage the hostile Target
c. Engage the closest Target
d. It makes no difference in what order you engage the Targets.

91. On the average, approximately how many Targets pop-up during each practice trial?

a. 1
b. 3
c. 6
d. 9

92. Which of the following would be the most effective strategy for defending your outer defensive perimeter?

a. Zoom-out to 128 nm, locate the Marker Targets, and check the speed of targets near the outer perimeter.
b. Zoom-out to 256 nm, locate the Marker Targets, and check the speed of targets near the outer perimeter.
c. Zoom-out to 128 nm, locate a Hostile Air Target, and check the speed of targets near that target.
d. Zoom-out to 256 nm, locate a Hostile Air Target, and check the speed of targets near that target.

93. If all penalty intrusions cost -100 points, which would be the most effective strategy?

a. Do not allow any Targets to enter your Inner Defensive perimeter, even if it means allowing targets to cross your Outer Defensive perimeter.
b. Do not allow any Targets to enter your Outer Defensive perimeter, even if it means allowing targets to cross your Inner Defensive perimeter.
c. Defend both your Inner and Outer Defensive perimeters equally.
d. None of these are effective strategies.

94. It is important to make trade-offs between targets:

a. That are Hostile and those that are Peaceful.
b. Approaching your Inner and Outer perimeters.
c. That are Civilian and those that are Military.
d. That have already crossed your Inner Defensive perimeter, and those that are approaching your Outer Defensive perimeter.

Manipulation Check

The following questions ask you to rate the extent to which you heard the objectives listed below during this study. Please use the scale below to answer the following questions:

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree

During this session, were you told that your objectives were to:

1. show yourself that you can be successful on this task?
2. learn as much as you can about the simulation?
3. explore challenging and difficult parts of this task?
4. persist when you make mistakes?

5. show yourself that you cannot fail at this task?
6. avoid not fully learning about the different parts of the simulation?
7. avoid forgetting what you have learned about this task?
8. strive to avoid making mistakes or doing anything wrong or incorrectly?

9. perform better than other students on this task?
10. demonstrate your ability by getting a good score on the simulation?
11. show your skills on things you are able to do?
12. prove that you can be successful on this task?

13. not do worse than other students on this task?
14. avoid performing poorly on this simulation?
15. avoid showing you have low ability?
16. avoid parts of the simulation where you might encounter obstacles?

Final Training Motivation

This last set of questions asks you to describe how motivated you were in this training program overall. Please use the scale shown below to make your ratings.

1	2	3	4	5
Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree

1. I put forth effort to answer questions honestly and accurately.
2. I tried to do well when playing the simulation.
3. Overall, I was motivated to do well on all parts of the experiment.

APPENDIX F

Feedback Choices

Basic Feedback: "Things about my performance on basic parts of the task"

	Correct	Incorrect
Process	"Ways to improve my performance" 1. Study manual on how to make correct decisions 2. Study manual on how to correctly prosecute targets 3. Ways to improve score by continuing correct decisions	"Ways to stop making bad decisions" 1. Study manual on ways to stop making incorrect decisions 2. Study manual on how to stop incorrectly prosecuting targets 3. Ways to improve score by stopping incorrect decisions
Outcome	"Decisions I made that are helping my score" 1. # type, class, intent, final engagement decisions correct 2. # peaceful targets correctly prosecuted 3. # hostile targets correctly prosecuted 4. Score from performing basic aspects of the task correctly	"Decisions I made that are hurting my score" 1. # type, class, intent, final engagement decisions incorrect 2. # peaceful targets incorrectly prosecuted 3. # hostile targets incorrectly prosecuted 4. Score from performing basic aspects of the task incorrectly
Self-referenced	"What I've done correctly relative to my past performance" Over the course of the last practice trial, you have increased your: 1. # type, class, intent, final engagement decisions correct 2. # peaceful targets correctly prosecuted 3. # hostile targets correctly prosecuted 4. Score from performing basic aspects of the task correctly _____ amount relative to how you did over the last practice trial	"What I've done incorrectly relative to my past performance" Over the course of the last practice trial, you have decreased your: 1. # type, class, intent, final engagement decisions incorrect 2. # peaceful targets incorrectly prosecuted 3. # hostile targets incorrectly prosecuted 4. Score from performing basic aspects of the task incorrectly _____ amount relative to how you did over the last practice trial
Normative	"What I've done correctly compared to others" Same information as self-referenced but relative to 50th and 85th percentiles	"What I've done incorrectly compared to others" Same information as self-referenced but relative to 50th and 85th percentiles

Strategic Feedback: "Things about my performance on advanced parts of the task"

	Correct	Incorrect
Process	"Ways to improve my performance" 1. Study manual on how to prosecute high priority targets 2. Study manual on how to make trade-offs between targets at inner and outer perimeters 3. Study manual on how to prosecute pop-up targets 4. Study manual on how to check marker targets 5. Ways to improve score by continuing correct decisions	"Ways to stop making bad decisions" 1. Study manual on how to stop incorrectly prosecuting high priority targets 2. Study manual on how to stop incorrectly making trade-offs 3. Study manual on how to stop incorrectly prosecuting pop-up targets 4. Study manual on how to stop incorrectly not checking marker targets 5. Ways to improve score by stopping incorrect decisions
Outcome	"Decisions I made that are helping my score" 1. # high priority targets correctly prosecuted 2. # targets near inner perimeter speed checked 3. # pop-up targets correctly prosecuted 4. # marker targets checked 5. Score from correctly performing strategic aspects of the task	"Decisions I made that are hurting my score" 1. # high priority targets incorrectly prosecuted 2. # targets near inner perimeter speed not checked 3. # pop-up targets incorrectly prosecuted 4. # marker targets not checked 5. Score from incorrectly performing strategic aspects of the task
Self-referenced	"What I've done correctly relative to my past performance" Over the course of the last practice trial, you have increased your: 1. # high priority targets correctly prosecuted 2. # targets near inner perimeter speed checked 3. # pop-up targets correctly prosecuted 4. # marker targets checked 5. Score from correctly performing strategic aspects of the task _____ amount relative to how you did over the last practice trial	"What I've done incorrectly relative to my past performance" Over the course of the last practice trial, you have decreased your: 1. # high priority targets incorrectly prosecuted 2. # targets near inner perimeter speed not checked 3. # pop-up targets incorrectly prosecuted 4. # marker targets not checked 5. Score from incorrectly performing strategic aspects of the task _____ amount relative to how you did over the last practice trial
Normative	"What I've done correctly compared to others" Same information as self-referenced but relative to 50th and 85th percentiles	"What I've done incorrectly compared to others" Same information as self-referenced but relative to 50th and 85th percentiles

APPENDIX G

Debriefing Sheet

Tactical Action Project

The study in which you just participated was designed to examine the effects of individuals' goal orientation on feedback seeking and performance. We are interested in examining whether individuals demonstrate different levels of knowledge and performance depending on whether their goal is to (1) learn the task; (2) perform as well as possible; (3) avoid performing poorly; or (4) avoid not learning the task. During this study, you operated a radar simulation known as TANDEM. TANDEM simulates the complex physical performance, information processing, and decision-making demands of performing fast-paced, critical tasks. To perform the TANDEM simulation, you needed to learn how to operate the task and develop strategies for effective task performance. TANDEM required you to gather information about the objects on the screen, make decisions, and take actions based on the information you gathered. We will use the information gathered during the study to link your performance on the task to your knowledge of the task. In addition, we will examine how your goal orientation impacts these outcomes. We expect that not only will different types of goal orientation to have different effects on these outcomes, but the influence of goal orientation will also influence the type of feedback that you seek. For example, if your goal is to master the task, we would expect you to spend time on feedback that helps you learn the new and more difficult parts of the task as well as look at information that tells you if you're improving over your own past performance. However, if your goal is to simply perform well on the task, we would expect you to seek feedback that tells you how you're doing relative to other people and spend time reviewing information that you know you're already good at so you can continue to be good at those things. We will be able to test these relationships because different groups of subjects are receiving different goal orientation prompts at the beginning and throughout each session.

If you have any questions about this study or would like to receive a copy of the results when they are complete, please notify the investigator now. If, in the future, you have any questions about the study or would like to receive the results when they are complete, please call the investigator listed below. Finally, thank you for participating in this study. If you have any other questions or comments please do not hesitate from contacting the experimenter.

Investigator: Jaclyn Nowakowski 355-2171 or nowako18@msu.edu

APPENDIX H

Description of Prizes

Tactical Action Project
Prizes

We will award a total of six cash prizes to the best players. These awards will be given to people who perform the best given the training objectives you'll be asked to focus on today. Two categories of proficiency will be recognized, and three awards will be offered in each category:

Two 1st place prizes at $30 each
Two 2nd place prizes at $20 each
Two 3rd place prizes at $10 each

Each set of three awards will be made for different types of game proficiency:

One pair of awards will be made for the players who understand the game the best during the three practice sessions. You will answer several questionnaires about the game during and after the practice sessions. You need to think carefully about your answers to the questions. The top players who answer these questions the best will be awarded 1st, 2nd, and 3rd place prizes.

The second pair of awards will be made for the players who do the best on the final two trials that will take place at the end of the experiment. The top players who do the best will be awarded 1st, 2nd, and 3rd place prizes. I will let you know when the final trials are about to begin.

The prizes are independent of each other. That means its possible to be awarded prizes in both categories of proficiency – you could win $60 if you display the highest levels of knowledge and performance. You will be competing against 50 to 80 other students for these awards. Your chances of getting an award are pretty good – it's all up to you.

APPENDIX I

Summary Tests of Hypotheses

Hypothesis	Analysis Conducted	Supported?
H1a: Over the course of training, mastery-oriented individuals are more likely to seek process feedback relative to outcome feedback, while performance-oriented individuals are more likely to seek outcome feedback relative to process feedback.	Dependent groups t-test	Partial
H1b: Over the course of training, mastery-oriented individuals are more likely to seek process feedback compared to performance-oriented individuals, who are more likely to seek outcome feedback relative to mastery-oriented individuals.	MANCOVA	Yes
H2a: Over the course of training, approach-oriented individuals are more likely to seek correct feedback relative to incorrect feedback, while avoid-oriented individuals are more likely to seek incorrect feedback relative to correct feedback.	Dependent groups t-test	Partial
H2b: Over the course of training, approach-oriented individuals are more likely to seek correct feedback compared to avoid-oriented individuals, who are more likely to seek incorrect feedback compared to approach-oriented individuals.	MANCOVA	No
H3a: Over the course of training, mastery-oriented individuals are more likely to seek self-referenced feedback relative to normative feedback, while performance-oriented individuals are more likely to seek normative feedback relative to self-referenced feedback.	Dependent groups t-test	Partial
H3b: Over the course of training, mastery-oriented individuals are more likely to seek self-referenced feedback compared to performance-oriented individuals, who are more likely to seek normative feedback	MANCOVA	Yes

relative to mastery-oriented individuals.		
H4a: Over the course of training, mastery-oriented individuals are more likely to seek feedback on complex aspects of their performance relative to feedback on more basic aspects of performance, while performance-oriented individuals are more likely to seek feedback on basic aspects of their performance relative to feedback on more complex aspects of performance.	Dependent groups t-test	Partial
H4b: Over the course of training, mastery-oriented individuals are more likely to seek complex feedback compared to performance-oriented individuals, who are more likely to seek basic feedback compared to mastery-oriented individuals.	MANCOVA	Yes
H5a: Performance-oriented learners will report higher perceived goal progress compared to mastery-oriented learners.	RM-MANCOVA	Yes
H5b: Avoid-oriented learners will report higher perceived goal progress compared to approach-oriented learners.	RM-MANCOVA	No
H5c: There will be an interaction between the mastery-performance and the approach-avoidance dimensions of goal orientation such that (1) performance-oriented individuals will report high perceived goal progress regardless of approach- or avoid-orientation and (2) mastery-oriented individuals will report high perceived goal progress only under an avoid-orientation.	RM-MANCOVA	No
H6a: Mastery-oriented learners will report higher frustration compared to performance-oriented learners.	RM-MANCOVA	Yes
H6b: Avoid-oriented learners will report higher frustration compared to approach-oriented learners.	RM-MANCOVA	No
H6c: There will be an interaction between the mastery-performance and the approach-avoidance dimensions of goal orientation such that (1) mastery-oriented individuals will report high levels of frustration regardless of approach- or avoid-orientation	RM-MANCOVA	Yes

and (2) performance-oriented individuals will report low levels of frustration only under an avoid-orientation.		
H7a: Mastery-oriented learners will report higher self-efficacy compared to performance-oriented learners.	RM-MANCOVA	No
H7b: Approach-oriented learners will report higher self-efficacy compared to avoid-oriented learners.	RM-MANCOVA	No
H7c: There will be an interaction between the mastery-performance and the approach-avoidance dimensions of goal orientation such that (1) mastery-oriented individuals will report high levels of self-efficacy regardless of approach- or avoid-orientation and (2) performance-oriented individuals will report higher levels of self-efficacy only under an approach-orientation.	RM-MANCOVA	No
H8a: Performance-oriented learners will report higher off task thoughts compared to mastery-oriented learners.	RM-MANCOVA	No
H8b: Avoid-oriented learners will report higher off task thoughts compared to approach-oriented learners.	RM-MANCOVA	No
H8c: There will be an interaction between the mastery-performance and the approach-avoidance dimensions of goal orientation such that (1) performance-oriented individuals will report higher off task thoughts regardless of approach- or avoid-orientation and (2) mastery-oriented individuals will report higher levels of off task thoughts only under an avoid-orientation.	RM-MANCOVA	No
H9a: Mastery-oriented learners will report higher levels of metacognition compared to performance-oriented learners.	RM-MANCOVA	No
H9b: Approach-oriented learners will report higher levels of metacognition compared to avoid-oriented learners.	RM-MANCOVA	No
H10a: Mastery-oriented learners will expend more cognitive effort studying the task	MANCOVA	Yes

manual compared to performance-oriented learners.		
H10b: Approach-oriented learners will expend more cognitive effort time studying the task manual compared to avoid-oriented learners.	MANCOVA	No
H10c: There will be an interaction between the mastery-performance and the approach-avoidance dimensions of goal orientation such that (1) performance-oriented individuals will expend less cognitive effort studying the task manual regardless of approach- or avoid-orientation and (2) mastery-oriented individuals will expend less cognitive effort studying the task manual only under an avoid-orientation.	MANCOVA	No
H11a: Over the course of training, mastery-oriented individuals will expend more cognitive effort studying strategic knowledge parts of the manual relative to basic parts, while performance-oriented individuals will expend more cognitive effort studying basic knowledge parts of the manual relative to strategic parts.	Dependent groups t-test	Partial
H11b: Over the course of training, mastery-oriented individuals are more likely to expend cognitive effort on strategic parts of the manual compared to performance-oriented individuals, who are more likely to expend cognitive effort on basic parts of the manual relative to mastery-oriented individuals.	MANCOVA	Partial
H12a: Mastery-oriented learners will spend more time cognitively reflecting on feedback compared to performance-oriented learners.	MANCOVA	Yes
H12b: Approach-oriented learners will spend more time cognitively reflecting on feedback compared to avoid-oriented learners.	MANCOVA	No
H12c: There will be an interaction between the mastery-performance and the approach-avoidance dimensions of goal orientation such that (1) performance-oriented individuals will spend less time reviewing	MANCOVA	No

feedback regardless of approach- or avoid-orientation and (2) mastery-oriented individuals will spend less time reviewing feedback only under an avoid-orientation.		
H13a: There will be no differences between mastery- and performance-oriented learners on levels of basic knowledge.	MANCOVA	Yes
H13b: Approach-oriented learners will achieve higher basic knowledge compared to avoid-oriented learners.	MANCOVA	No
H14a: Mastery-oriented learners will achieve higher strategic knowledge compared to performance-oriented learners.	MANCOVA	No
H14b: Approach-oriented learners will achieve higher strategic knowledge compared to avoid-oriented learners.	MANCOVA	No
H15a: There will be no differences between mastery- and performance-oriented learners on levels of basic task performance.	MANCOVA	No
H15b: Approach-oriented learners will achieve higher basic performance compared to avoid-oriented learners.	MANCOVA	No
H16a: Mastery-oriented learners will achieve higher strategic performance compared to performance-oriented learners.	MANCOVA	Yes
H16b: Approach-oriented learners will achieve higher strategic performance compared to avoid-oriented learners.	MANCOVA	No
H16c: There will be an interaction between the mastery-performance and the approach-avoidance dimensions of goal orientation such that (1) performance-oriented individuals will display low levels of strategic task performance regardless of approach- or avoid-orientation and (2) mastery-oriented individuals will display lower strategic performance only under an avoid-orientation.	MANCOVA	No
H17a: Mastery-oriented learners will achieve higher generalization performance compared to performance-oriented learners.	MANCOVA	No

H17b: Approach-oriented learners will achieve higher generalization performance compared to avoid-oriented learners.	MANCOVA	No
H17c: There will be an interaction between the mastery-performance and the approach-avoidance dimensions of goal orientation such that (1) performance-oriented individuals will display low levels of generalization performance regardless of approach- or avoid-orientation and (2) mastery-oriented individuals will display lower generalization performance only under an avoid-orientation.	MANCOVA	No
H18: Over the course of training, there will be a three-way interaction between the mastery-performance dimension, approach-avoid dimension, and time, causing the level of perceived goal progress predicted in Hypothesis 5 to change, such that the level of perceived goal progress in mastery-avoid learners is expected to decrease over time.	RM-MANCOVA	Yes
H19: Over the course of training, there will be a three-way interaction between the mastery-performance dimension, approach-avoid dimension, and time, causing the level of frustration predicted in Hypothesis 6 to change, such that:	RM-MANCOVA	
H19a: The level of frustration in mastery-avoid learners is expected to increase over time, and,	RM-MANCOVA	No
H19b: The level of frustration in performance-avoid learners is expected to decrease over time.	RM-MANCOVA	No
H20: Over the course of training, there will be a three-way interaction between the mastery-performance dimension, approach-avoid dimension, and time, causing the level of self-efficacy predicted in Hypothesis 7 to change, such that:	RM-MANCOVA	
H20a: The level of efficacy in mastery-avoid learners is expected to decline over time, and,	RM-MANCOVA	No
H20b: The level of efficacy in performance-approach learners is expected to increase over time.	RM-MANCOVA	No

H21: Over the course of training, there will be a three-way interaction between the mastery-performance dimension, approach-avoid dimension, and time, causing the level of off task thoughts predicted in Hypothesis 8 to change, such that:	RM-MANCOVA	
H21a: The level of off task thoughts in performance-approach learners is expected to increase over time, and,	RM-MANCOVA	No
H21b: The level of off task thoughts in mastery-avoid learners is expected to increase over time.	RM-MANCOVA	No
H22: Over the course of training, there will be a three-way interaction between the mastery-performance dimension, approach-avoid dimension, and time, causing the amount of cognitive effort studying the task manual predicted in Hypothesis 10 to change, such that the cognitive effort spent studying the task manual in performance-approach learners is expected to decrease over time.	RM-MANCOVA	No
H23: Over the course of training, there will be a three-way interaction between the mastery-performance dimension, approach-avoid dimension, and time, causing the amount of cognitive reflection on reviewing feedback predicted in Hypothesis 12 to change, such that the amount of cognitive reflection on reviewing feedback in performance-approach learners is expected to decrease over time.	RM-MANCOVA	No

APPENDIX J

Table 1

Means, Standard Deviations, and Intercorrelations for Variables Included in Analyses

Variable	M	SD	1	2	3	4	5	6	7
1. Mast-perf	--	--	--						
2. App-avoid	--	--	-.013	--					
3. Ability	0.26	0.70	-.037	-.029	--				
4. VW Learning	4.88	0.82	.015	-.030	-.028	--			
5. VW Performance-app	4.24	1.05	-.054	-.004	-.041	.321**	--		
6. VW Performance-avoid	3.26	1.09	-.045	-.035	-.042	-.157**	.249**	--	
7. EM Mastery-app	3.89	0.63	.001	.033	-.001	.449**	.132**	-.183**	--
8. EM Mastery-avoid	3.28	0.80	-.050	.030	-.077	-.038	.001	.203**	.277**
9. EM Performance-app	3.40	0.82	-.080	.001	-.037	.086	.523**	.325**	.065
10. EM Performance-avoid	3.17	0.85	-.062	-.029	.003	-.172**	.280**	.455**	-.089

Note. N = 393. * Correlation is significant at the 0.05 level (2-tailed). ** Correlation is significant at the 0.01 level (2-tailed). Mast-perf = Mastery-performance manipulation. App-avoid = Approach-avoid manipulation. VW = VandeWalle (1997) trait measure of goal orientation. App. = Approach. EM = Elliot & McGregor (2001) trait measure of goal orientation.

Table 1 (cont'd).

Means, Standard Deviations, and Intercorrelations for Variables Included in Analyses

Variable	M	SD	1	2	3	4	5	6	7
11. Goal progress (1)	3.32	0.84	.055	-.041	.228**	-.017	-.125*	-.064	-.016
12. Goal progress (2)	3.62	0.73	.098	.029	.154**	.112*	.055	-.019	.046
13. Frustration (1)	2.56	0.75	-.172**	.006	-.166**	.023	.143**	.020	-.002
14. Frustration (2)	2.37	0.83	-.142**	-.091	-.138**	.000	.050	-.011	-.022
15. Self-efficacy (1)	3.46	0.75	.124*	-.057	.219**	.046	-.037	-.054	.031
16. Self-efficacy (2)	3.56	0.82	.097	-.035	.200**	.032	-.005	-.012	.033
17. Off task thoughts (1)	1.87	0.73	-.058	.004	-.122*	-.026	-.032	.024	-.034
18. Off task thoughts (2)	2.02	0.89	-.135**	-.050	-.124*	.016	.000	-.014	.021
19. Metacognition (1)	3.73	0.63	.022	-.001	.064	-.027	-.021	.006	-.033
20. Metacognition (2)	3.61	0.71	.012	-.042	.043	.070	.082	-.048	-.027
21. State M-App (1)	3.39	0.97	.073	-.002	.050	.098	.001	.007	.075
22. State M-App (2)	3.23	0.98	.022	-.006	.077	.060	.007	-.048	.110*
23. State M-Av (1)	2.81	1.06	.005	-.028	-.098	.056	.091	.000	.064
24. State M-Av (2)	2.65	0.94	.012	.014	-.059	.058	.088	-.028	.049

Note. (1) denotes variable was measured after trial 3. (2) denotes variable was measured after trial 9. State M-App = State mastery-approach orientation. State M-Av = State mastery-avoid orientation.

Table 1 (cont'd).

Means, Standard Deviations, and Intercorrelations for Variables Included in Analyses

Variable	M	SD	1	2	3	4	5	6	7
25. State P-App (1)	3.11	1.06	.081	.001	.084	.083	.075	-.018	.091
26. State P-App (2)	3.08	1.03	.081	.001	.080	.065	.042	.003	.081
27. State P-Av (1)	3.06	0.98	.016	.048	-.186**	.018	.076	.059	-.066
28. State P-Av (2)	2.97	0.97	.010	.014	-.207**	.004	.084	.011	-.038
29. Basic knowledge (1)	7.89	2.37	-.011	.097	.004	.097	.039	.051	.025
30. Basic knowledge (2)	9.48	1.87	.029	.003	-.085	.085	.054	.083	.038
31. Strategic knowledge (1)	5.21	2.40	.050	.025	.034	-.003	-.011	.013	-.009
32. Strategic knowledge (2)	7.57	2.34	-.006	.097	.095	.061	-.001	.128*	.016
33. Total study time	18:36	3:25	-.102*	-.003	-.052	-.041	-.015	-.026	-.034
34. Total basic study time	11:47	3:31	.000	.038	-.215**	-.042	.014	-.043	.016
35. Total strat. study time	5:21	2:27	-.100*	-.047	.206**	.011	-.035	.008	-.034
36. Total feedback time	14:11	3:48	-.147**	-.025	-.035	.022	.046	.045	-.004
37. Total basic FB time	7:47	3:22	-.029	-.020	-.124*	.011	.099*	.060	.037
38. Total strategic FB time	6:20	3:21	-.138**	-.008	.088	.014	-.047	-.006	-.042

Note. State P-App = State performance-approach orientation. State P-Av = State performance-avoid orientation. Time is in minutes and seconds. FB = Feedback. Strat. = Strategic.

Table 1 (cont'd).

Means, Standard Deviations, and Intercorrelations for Variables Included in Analyses

Variable	M	SD	1	2	3	4	5	6	7
39. Total correct FB time	8:02	2:28	-.095	-.011	.026	.014	.004	.037	.003
40. Total incorrect FB time	6:06	2:32	-.128*	-.027	-.074	.020	.065	.035	-.011
41. Total process FB time	6:29	2:57	-.117*	-.062	.032	.008	-.053	.021	-.050
42. Total outcome FB time	3:36	1:40	-.054	.112*	-.055	-.009	.086	.029	.009
43. Total self-ref. FB time	1:55	1:07	-.139**	-.027	-.132**	.048	.105*	.073	.009
44. Total norm. FB time	2:06	0:58	.032	-.071	.023	.022	.072	-.014	.104*
45. Basic performance (1)	-81.17	388.81	.088	-.002	.279**	-.014	-.043	-.080	-.027
46. Basic performance (2)	366.67	493.41	.083	-.062	.336**	-.030	.100*	-.049	-.024
47. Strat. performance (1)	2.96	0.28	.078	.098	-.156**	.007	-.071	.037	-.037
48. Strat. performance (2)	2.45	0.93	.101*	.055	-.306**	-.020	.003	.044	-.004
49. Gen. performance	0.0	0.55	.107*	.006	.027	-.052	.064	-.047	-.053

Note. Self-ref. = Self-referenced. Norm. = Normative. Gen. = Generalization trial.

Table 1 (cont'd).

Means, Standard Deviations, and Intercorrelations for Variables Included in Analyses

Variable	8	9	10	11	12	13	14	15	16
9. EM Performance-prove	.034	--							
10. EM Performance-avoid	.204**	.461**	--						
11. Goal progress (1)	-.049	-.079	-.089	--					
12. Goal progress (2)	.014	.059	-.043	.283**	--				
13. Frustration (1)	.070	.072	.109*	-.600**	-.240**	--			
14. Frustration (2)	.006	-.022	.053	-.285**	-.646**	.486**	--		
15. Self-efficacy (1)	-.120*	-.078	-.129*	.541**	.309**	-.523**	-.337**	--	
16. Self-efficacy (2)	-.043	-.005	-.078	.322**	.638**	-.329**	-.609**	.619**	--
17. Off task thoughts (1)	.102*	.009	.053	-.262**	-.228**	.356**	.250**	-.413**	-.246**
18. Off task thoughts (2)	.040	-.002	.022	-.164**	-.444**	.265**	.506**	-.321**	-.447**
19. Metacognition (1)	-.057	-.033	-.084	.290**	.262**	-.140**	-.069	.512**	.323**
20. Metacognition (2)	-.032	.050	-.048	.147**	.457**	-.117*	-.260**	.367**	.480**
21. State M-App (1)	-.016	-.050	-.034	.164**	.242**	-.153**	-.080	.438**	.350**
22. State M-App (2)	.000	-.028	-.061	.163**	.312**	-.136**	-.192**	.434**	.474**
23. State M-Av (1)	.003	.037	.060	-.280**	.009	.304**	.173**	-1.64**	-.071
24. State M-Av (2)	-.030	-.015	.023	-.135**	-.054	.186**	.215**	-.039	-.075

Table 1 (cont'd).

Means, Standard Deviations, and Intercorrelations for Variables Included in Analyses

Variable	8	9	10	11	12	13	14	15	16
25. State P-App (1)	.006	-.030	-.048	.120*	.086	-.032	.048	.369**	.283**
26. State P-App (2)	-.003	-.007	-.042	.070	.132**	.019	.008	.261**	.318**
27. State P-Av (1)	.017	.120*	.090	-.214**	-.112*	.287**	.277**	-.153**	-.207**
28. State P-Av (2)	-.019	.059	.097	-.234**	-.057	.296**	.205**	-.171**	-.112**
29. Basic knowledge (1)	.058	.033	.012	-.062	-.047	.009	.013	-.047	.014
30. Basic knowledge (2)	.059	.044	.026	-.069	-.011	.096	.047	-.064	-.021
31. Strategic knowledge (1)	.036	.004	-.011	.061	-.008	-.023	-.014	.004	.017
32. Strategic knowledge (2)	.071	.063	.053	-.025	-.051	.034	.027	-.081	-.033
33. Total study time	-.003	.020	.028	-.097	.060	.117*	.048	-.067	.016
34. Total basic study time	.017	.037	.016	-.191**	.051	.168**	.031	-.137**	-.017
35. Total strat. study time	-.039	-.030	-.005	.143**	.049	-.061	.007	.124*	.066
36. Total feedback time	.051	.020	.050	-.122*	.069	.195**	.079	-.143**	-.019
37. Total basic FB time	.097	.022	.072	-.131**	.104*	.176**	-.021	-.147**	-.023
38. Total strategic FB time	-.040	.000	-.017	-.005	-.024	.043	.110*	-.012	.002
39. Total correct FB time	.065	-.005	-.008	-.029	.112*	.105*	-.033	-.059	.032
40. Total incorrect FB time	.013	.034	.082	-.154**	-.003	.189**	.150**	-.154**	-.059

Table 1 (cont'd).

Means, Standard Deviations, and Intercorrelations for Variables Included in Analyses

Variable	8	9	10	11	12	13	14	15	16
41. Total process FB time	.011	-.021	.025	-.085	.108*	.136**	.014	-.132**	-.026
42. Total outcome FB time	.023	.059	-.005	-.034	.094	.059	-.030	.010	.071
43. Total self-ref. FB time	.040	-.014	.069	-.107*	-.147**	.106*	.153**	-.156**	-.138**
44. Total norm. FB time	.081	.056	.048	-.035	-.044	.123*	.139**	.011	.047
45. Basic performance (1)	-.076	-.063	-.029	.409**	.165**	-.371**	-.201**	.391**	.242**
46. Basic performance (2)	-.049	.091	.044	.239**	.475**	-.204**	-.422**	.302**	.488**
47. Strat. performance (1)	-.043	-.037	.046	-.091	-.103*	-.005	.068	-.088	-.074
48. Strat. performance (2)	.033	-.058	.003	-.165**	-.231**	.142**	.237**	-.190**	-.260**
49. Gen. performance	-.061	.027	.030	.101*	.170**	-.132**	-.169**	.148**	.211**

Table 1 (cont'd).

Means, Standard Deviations, and Intercorrelations for Variables Included in Analyses

Variable	17	18	19	20	21	22	23	24	25
18. Off task thoughts (2)	.649**	--							
19. Metacognition (1)	-.483**	-.342**	--						
20. Metacognition (2)	-.332**	-.460**	.641**	--					
21. State M-App (1)	-.438**	-.361**	.548**	.514**	--				
22. State M-App (2)	-.387**	-.429**	.432**	.567**	.758**	--			
23. State M-Av (1)	-.076	-.141**	.130**	.214**	.435**	.323**	--		
24. State M-Av (2)	-.128*	-.159**	.137**	.184**	.389**	.421**	.616**	--	
25. State P-App (1)	-.294**	-.192**	.412**	.282**	.545**	.460**	.247**	.231**	--
26. State P-App (2)	-.183**	-.141**	.316**	.290**	.440**	.427**	.200**	.187**	.802**
27. State P-Av (1)	-.030	-.013	.167**	.099*	.202**	.109*	.413**	.376**	.216**
28. State P-Av (2)	.011	-.037	.093	.123*	.167**	.188**	.419**	.422**	.207**
29. Basic knowledge (1)	.046	-.001	-.043	-.002	.037	.003	.000	-.006	.014
30. Basic knowledge (2)	.036	.004	-.055	-.036	-.010	-.018	.058	.037	-.012
31. Strategic knowledge (1)	-.007	-.066	-.016	.024	.004	.040	-.013	.035	.027
32. Strategic knowledge (2)	.044	.018	-.104*	-.071	-.035	-.001	-.017	.000	.010
33. Total study time	-.086	-.156**	.086	.181**	.155**	.130**	.241**	.185**	.064

Table 1 (cont'd).

Means, Standard Deviations, and Intercorrelations for Variables Included in Analyses

Variable	17	18	19	20	21	22	23	24	25
34. Total basic study time	.007	-.068	-.005	.075	.030	.036	.195**	.151**	-.084
35. Total strat. study time	-.181**	-.144**	.188**	.172**	.208**	.139**	.092	.043	.205**
36. Total feedback time	-.172**	-.182**	.162**	.242**	.198**	.152**	.305**	.231**	.081
37. Total basic FB time	-.023	-.140**	.018	.128*	.024	.013	.206**	.152**	-.107*
38. Total strategic FB time	-.175**	-.067	.169**	.148**	.201**	.161**	.139**	.108*	.201**
39. Total correct FB time	-.128*	-.144*	.147**	.164**	.157**	.089	.208**	.120*	.061
40. Total incorrect FB time	-.138**	-.133**	.105*	.206**	.146**	.143**	.255**	.229**	.065
41. Total process FB time	-.151**	-.194**	.155**	.203**	.142**	.083	.243**	.147**	-.012
42. Total outcome FB time	-.092	-.097	.089	.159**	.113*	.130*	.112*	.127*	.015
43. Total self-ref. FB time	-.016	.057	-.057	-.022	.175**	.033	.175**	.125*	.061
44. Total norm. FB time	-.047	-.023	.087	.092	.061	.085	.061	.092	.264**
45. Basic performance (1)	-.247**	-.189**	.211**	.138**	.145**	.160**	-.205**	-.155**	.143**
46. Basic performance (2)	-.218**	-.333**	.209**	.320**	.151**	.199**	-.105*	-.184**	.129*
47. Strat. performance (1)	.028	.028	-.098	-.061	-.068	-.055	-.028	.039	-.066
48. Strat. performance (2)	.151**	.184**	-.120*	-.161**	-.105*	-.175**	.053	.088	-.163**
49. Gen. performance	-.107*	-.125*	.113*	.138**	.045	.033	-.049	-.065	.014

Table 1 (cont'd).

Means, Standard Deviations, and Intercorrelations for Variables Included in Analyses

Variable	26	27	28	29	30	31	32	33	34
27. State P-Av (1)	.176**	--							
28. State P-Av (2)	.219**	.715**	--						
29. Basic knowledge (1)	.022	-.069	-.069	--					
30. Basic knowledge (2)	.005	.011	.003	.588**	--				
31. Strategic knowledge (1)	.026	-.014	.035	.269**	.193**	--			
32. Strategic knowledge (2)	.022	.007	.008	.464**	.364**	.480**	--		
33. Total study time	.079	.119*	.088	-.037	-.009	-.013	-.049	--	
34. Total basic study time	-.045	.178**	.124*	-.059	-.012	-.057	-.059	.697**	--
35. Total strat. study time	.157**	-.074	-.044	.002	.000	.047	.001	.318**	-.395**
36. Total feedback time	.059	.131**	.146**	.060	.047	-.004	.023	.411**	.158**
37. Total basic FB time	-.093	.144**	.120*	.016	.028	-.065	-.016	.350**	.406**
38. Total strategic FB time	.161**	.004	.045	.049	.024	.059	.041	.115*	-.229**
39. Total correct FB time	.012	.077	.094	.021	.060	-.014	-.022	.277**	.104*
40. Total incorrect FB time	.079	.121*	.128*	.066	.011	.005	.055	.348**	.135**
41. Total process FB time	-.019	.099	.097	.026	-.027	.008	.020	.278**	.054
42. Total outcome FB time	.031	.009	.028	.021	.107*	.019	-.005	.274**	.160**

Table 1 (cont'd).

Means, Standard Deviations, and Intercorrelations for Variables Included in Analyses

Variable	26	27	28	29	30	31	32	33	34
43. Total self-ref. FB time	-.012	.131**	.129*	.033	-.001	-.055	-.018	.165**	.137**
44. Total norm. FB time	.253**	.046	.081	.076	.082	-.016	.055	.106*	.108
45. Basic performance (1)	.144**	-.128*	-.119*	-.047	-.003	-.045	-.031	-.143**	-.290**
46. Basic performance (2)	.171**	-.159**	-.083	.002	.017	.075	-.033	.018	-.085
47. Strat. performance (1)	-.075	.024	.040	.013	.050	.020	-.057	.032	.058
48. Strat. performance (2)	-.191**	.085	.055	.005	.023	-.066	.033	.000	.252**
49. Gen. performance	.035	-.103*	-.058	-.034	-.007	-.005	-.019	.075	.131**

Table 1 (cont'd).

Means, Standard Deviations, and Intercorrelations for Variables Included in Analyses

Variable	35	36	37	38	39	40	41	42	43
36. Total feedback time	.365**	--							
37. Total basic FB time	-.053	.570**	--						
38. Total strategic FB time	.470**	.563**	-.357**	--					
39. Total correct FB time	.253**	.755**	.471**	.386**	--				
40. Total incorrect FB time	.305**	.769**	.398**	.473**	.161**	--			
41. Total process FB time	.348**	.806**	.409**	.505**	.630**	.599**	--		
42. Total outcome FB time	.148**	.475**	.321**	.219**	.391**	.335**	.074	--	
43. Total self-ref. FB time	.014	.376**	.322**	.103*	.259**	.314**	.080	-.049	--
44. Total norm. FB time	.113*	.228**	.070	.187**	.082	.260**	-.090	-.016	.162**
45. Basic performance (1)	.204**	-.178**	-.160**	-.041	-.140**	-.130**	-.127**	-.043	-.159**
46. Basic performance (2)	.167**	-.005	-.011	.007	.028	-.032	-.040	.047	-.096
47. Strat. performance (1)	-.001	-.008	.079	-.089	-.021	.008	.023	-.004	-.018
48. Strat. performance (2)	-.337**	-.085	.220**	-.319**	-.084	-.048	-.104	-.079	.090
49. Gen. performance	-.050	-.116*	.040	-.171**	-.094	-.082	-.185**	.050	-.027

Table 1 (cont'd).

Means, Standard Deviations, and Intercorrelations for Variables Included in Analyses

Variable	44	45	46	47	48	49
45. Basic performance (1)	-.056	--				
46. Basic performance (2)	.139**	.435**	--			
47. Strat. performance (1)	-.075	-.005	-.128*			
48. Strat. performance (2)	.011	-.304**	-.295**	.214**	--	
49. Gen. performance	.054	.173**	.484**	.059	.309**	--

Table 2

Mean Levels of Self-Regulatory Processes

	Self-Efficacy	Metacognition	Frustration	Off Task Thoughts	Perceived Goal Progress
Mastery or Performance?					
Mastery	3.43	3.66	2.58	2.02	3.42
Performance	3.60	3.68	2.34	1.86	3.53
F (1, 384) =	6.30**	0.14	14.50**	5.03*	4.24*
Approach or Avoidance?					
Approach	3.55	3.68	2.50	1.96	3.48
Avoidance	3.48	3.65	2.43	1.92	3.47
F (1, 384) =	0.76	0.20	1.52	0.45	0.0

Note. ** $p < .01$; * $p < .05$.

Table 3

Mean Levels of Learning and Performance Outcomes

	Study Time			FB Time	Average Knowledge		Average Performance		
	Total	Basic	Strategic	Total	Basic	Strategic	Basic	Strategic	Gen.
Mastery or Performance?									
Mastery	18:56	11:47	5:35	14:44	8.67	6.34	106.40	0.74	-0.06
Performance	18:14	11:48	5:06	13:37	8.70	6.44	181.58	0.54	0.06
F (1, 384) =	4.08*	0.01	3.77*	8.22**	0.07	0.53	6.08**	4.13*	4.72*
Approach or Avoidance?									
Approach	18:36	11:40	5:28	14:17	8.57	6.25	158.00	0.72	-0.00
Avoidance	18:35	11:55	5:14	14:05	8.81	6.54	126.94	0.56	0.00
F (1, 384) =	0.01	0.40	0.63	0.30	1.44	2.07	0.32	2.18	0.97

Note. ** $p < .01$; * $p < .05$. Time is in minutes and seconds. FB = Feedback. Gen. = Generalization.

Table 4

Summary of Hierarchical Regression Analyses for Variables Predicting Content of Feedback Sought (N=393)

Variable	Total Basic Feedback				Total Strategic Feedback			
	B	SE B	β	ΔR^2	B	SE B	β	ΔR^2
Step 1								
Ability	-35.48	14.42	-0.12**	0.02**	25.03	14.41	0.09	0.01
Step 2								
Ability	-35.84	14.44	-0.13**		23.60	14.30	0.08	
Mastery-Performance	-13.46	20.32	-0.03	0.01*	-54.50	20.13	-0.14**	0.02**
Total R^2				0.03				0.03

Note. ** $p < .01$; * $p < .05$; † $p < .10$.

Table 4 (cont'd).

Summary of Hierarchical Regression Analyses for Variables Predicting Content of Feedback Sought (N=393)

Variable	Total Correct Feedback				Total Incorrect Feedback			
	B	SE B	β	ΔR^2	B	SE B	β	ΔR^2
Step 1								
Ability	5.49	10.65	0.03	0.00	-15.95	10.89	-0.07	0.00
Step 2								
Ability	4.75	10.62	0.02		-17.00	10.81	-0.08	
Mastery-Performance	-28.07	14.96	-0.10†	0.01†	-39.89	15.22	-0.13**	0.02**
Total R^2				0.01				0.02

Table 4 (cont'd).

Summary of Hierarchical Regression Analyses for Variables Predicting Content of Feedback Sought (N=393)

Variable	Total Process Feedback				Total Outcome Feedback			
	B	SE B	β	ΔR^2	B	SE B	β	ΔR^2
Step 1								
Ability	8.02	12.71	0.03	0.00	-7.77	7.18	-0.06	0.00
Step 2								
Ability	6.94	12.65	0.03		-8.07	7.19	-0.06	
Mastery-Performance	-41.18	17.80	-0.12*	0.01*	-11.27	10.12	-0.06	0.00
Total R^2				0.01				0.00

Table 4 (cont'd).

Summary of Hierarchical Regression Analyses for Variables Predicting Content of Feedback Sought (N=393)

Variable	Total Self-Referenced Feedback				Total Normative Feedback			
	B	SE B	β	ΔR^2	B	SE B	β	ΔR^2
Step 1								
Ability	-12.59	4.79	-0.13**	0.02**	1.89	4.20	0.02	0.00
Step 2								
Ability	-13.10	4.75	-0.14**		1.99	4.20	0.02	
Mastery-Performance	-19.33	6.68	-0.14**	0.02**	3.83	5.92	0.03	0.00
Total R^2				0.04				0.00

Table 5

Summary of Hierarchical Regression Analysis for Variables Predicting Average Self-Efficacy (N=393)

Variable	B	SE B	β	ΔR^2
Step 1				
Ability	0.23	0.05	0.23**	0.05**
Step 2				
Ability	0.24	0.05	0.24**	
Mastery-Performance	0.18	0.07	0.13**	0.02**
Step 3				
Ability	0.23	0.05	0.23**	
Mastery-Performance	0.16	0.07	0.11*	
Composite Mediator	-0.03	0.01	-0.10*	0.01*
Total R^2				0.08

Note. ** $p < .01$; * $p < .05$.

Table 6

Summary of Hierarchical Regression Analysis for Variables Predicting Average Frustration (N=393)

Variable	B	SE B	β	ΔR^2
Step 1				
Ability	-0.17	0.05	-0.18**	0.03**
Step 2				
Ability	-0.18	0.05	-0.18**	
Mastery-Performance	-0.26	0.07	-0.19**	0.04**
Step 3				
Ability	-0.17	0.05	-0.18**	
Mastery-Performance	-0.22	0.07	-0.16**	
Composite Mediator	0.03	0.01	0.15**	0.02**
Total R^2				0.09

Note. ** $p < .01$; * $p < .05$.

Table 7

Summary of Hierarchical Regression Analysis for Variables Predicting Average Off Task Thoughts (N=393)

Variable	B	SE B	β	ΔR^2
Step 1				
Ability	-0.14	0.05	-0.14**	0.02**
Step 2				
Ability	-0.15	0.05	-0.14**	
Mastery-Performance	-0.17	0.07	-0.12*	0.01*
Step 3				
Ability	-0.15	0.05	-0.15**	
Mastery-Performance	-0.22	0.07	-0.15**	
Composite Mediator	-0.05	0.01	-0.19**	0.03**
Total R^2				0.06

Note. ** $p < .01$; * $p < .05$.

Table 8

Summary of Hierarchical Regression Analysis for Variables Predicting Average Perceived Goal Progress (N=393)

Variable	B	SE B	β	ΔR^2
Step 1				
Ability	0.22	0.04	0.24**	0.06**
Step 2				
Ability	0.22	0.05	0.25**	
Mastery-Performance	0.13	0.06	0.10*	0.01*
Step 3				
Ability	0.22	0.05	0.24**	
Mastery-Performance	0.11	0.06	0.09	
Composite Mediator	-0.01	0.01	-0.07	0.00
Total R^2				0.07

Note. ** $p < .01$; * $p < .05$.

Table 9

Summary of Hierarchical Regression Analysis for Variables Predicting Total Study Time (N=393)

Variable	B	SE B	β	ΔR^2
Step 1				
Ability	-909.46	883.17	-0.05	0.00
Step 2				
Ability	-976.69	880.12	-0.06	
Mastery-Performance	-2554.07	1238.87	-0.10*	0.01*
Step 3				
Ability	-777.28	840.05	-0.04	
Mastery-Performance	-1156.16	1202.27	-0.05	
Composite Mediator	1327.62	210.69	0.31**	0.09**
Total R^2				0.10

Note. ** $p < .01$; * $p < .05$.

Table 10

Summary of Hierarchical Regression Analysis for Variables Predicting Total Strategic Study Time (N=393)

Variable	B	SE B	β	ΔR^2
Step 1				
Ability	2591.23	621.32	0.21**	0.04**
Step 2				
Ability	2547.99	619.74	0.20**	
Mastery-Performance	-1642.56	872.35	-0.09†	0.01†
Step 3				
Ability	2734.85	567.77	0.22	
Mastery-Performance	-332.71	812.59	-0.02	
Composite Mediator	1243.99	142.40	0.40**	0.16**
Total R^2				0.21

Note. ** $p < .01$; * $p < .05$.

Table 11

Summary of Hierarchical Regression Analysis for Variables Predicting Basic Performance (N=393)

Variable	B	SE B	β	ΔR^2
Step 1				
Ability	194.93	25.03	0.37**	0.13**
Step 2				
Ability	197.18	24.89	0.37**	
Mastery-Performance	85.46	35.03	0.11*	0.01*
Step 3				
Ability	195.28	24.82	0.37**	
Mastery-Performance	72.84	35.52	0.10*	
Composite Mediator	-11.99	6.23	-0.09†	0.01†
Total R^2				0.15

Note. ** $p < .01$; * $p < .05$; † $p < .10$.

Table 12

Summary of Hierarchical Regression Analysis for Variables Predicting Strategic Performance (N=393)

Variable	B	SE B	β	ΔR^2
Step 1				
Ability	-0.23	0.04	-0.32**	0.10**
Step 2				
Ability	-0.23	0.04	-0.32**	
Mastery-Performance	0.10	0.05	0.10*	0.01*
Step 3				
Ability	-0.23	0.04	-0.32**	
Mastery-Performance	0.08	0.05	0.08	
Composite Mediator	-0.02	0.01	-0.12**	0.02**
Total R^2				0.13

Note. ** $p < .01$; * $p < .05$.

Table 13

Summary of Hierarchical Regression Analysis for Variables Predicting Generalization Performance (N=393)

Variable	B	SE B	β	ΔR^2
Step 1				
Ability	0.02	0.04	0.03	0.00
Step 2				
Ability	0.02	0.04	0.03	
Mastery-Performance	0.12	0.06	0.11*	0.01*
Step 3				
Ability	0.02	0.04	0.03	
Mastery-Performance	0.09	0.06	0.08	
Composite Mediator	-0.03	0.01	-0.15**	0.02**
Total R^2				0.03

Note. ** $p < .01$; * $p < .05$.

APPENDIX K

Figure 1

Conceptual Framework

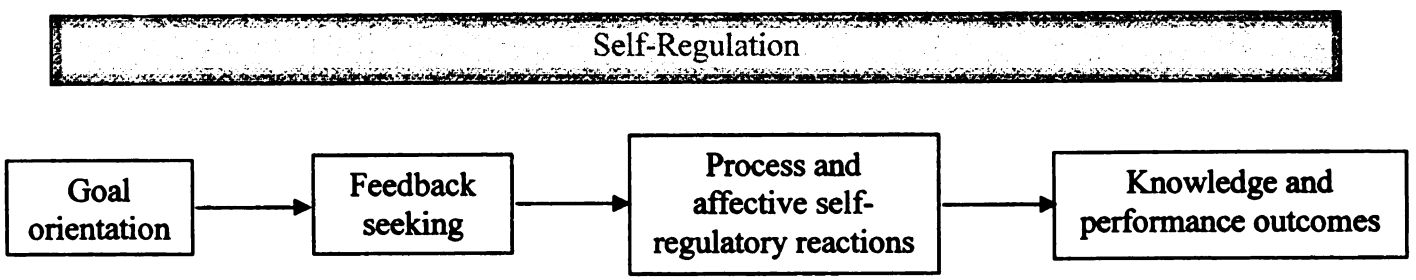


Figure 2

Research Model

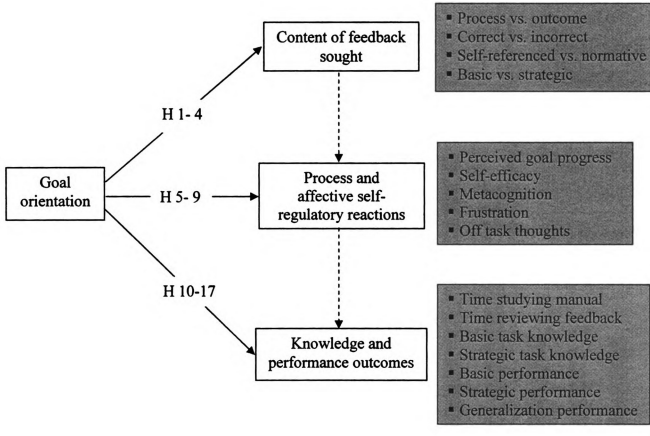


Figure 3

Total Feedback Sought: Mastery (n = 203) versus Performance (n = 190) Orientation

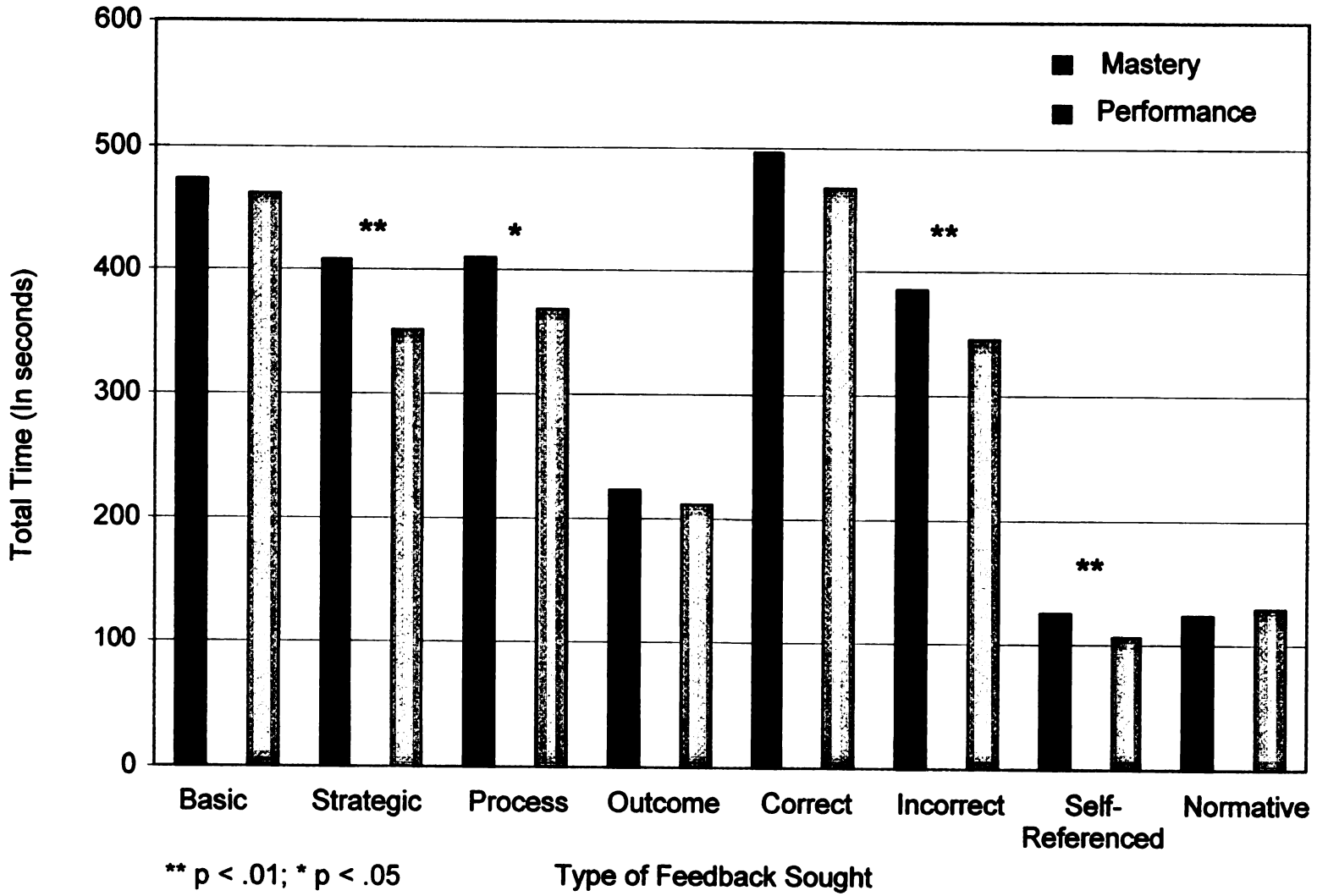


Figure 4

Total Feedback Sought: Approach (n = 200) versus Avoidance (n = 193) Motivation

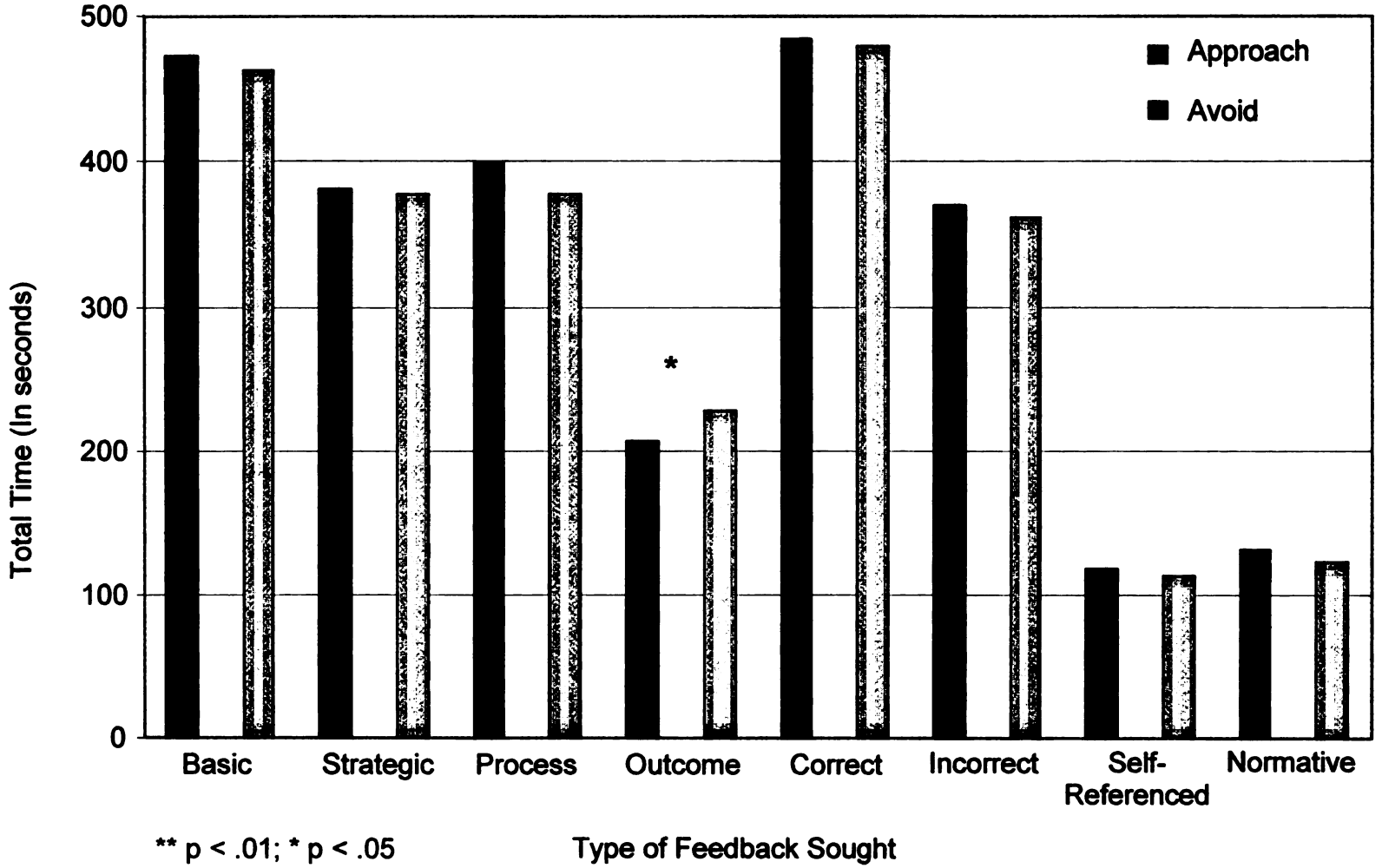


Figure 5

Interaction Between Mastery-Performance Orientation and Approach-Avoid Motivation Predicting Average Frustration

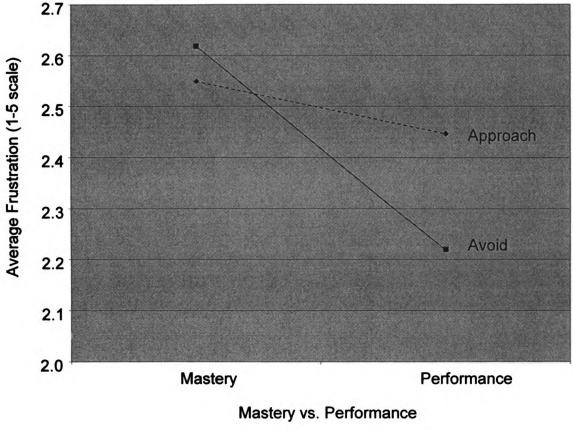


Figure 6

Interaction Between Mastery (Mast)-Performance (Perf) Orientation, Approach (App)-Avoid Motivation, and Time Predicting Perceived Goal Progress

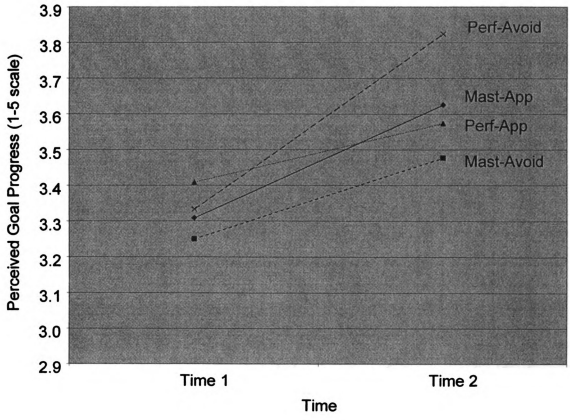
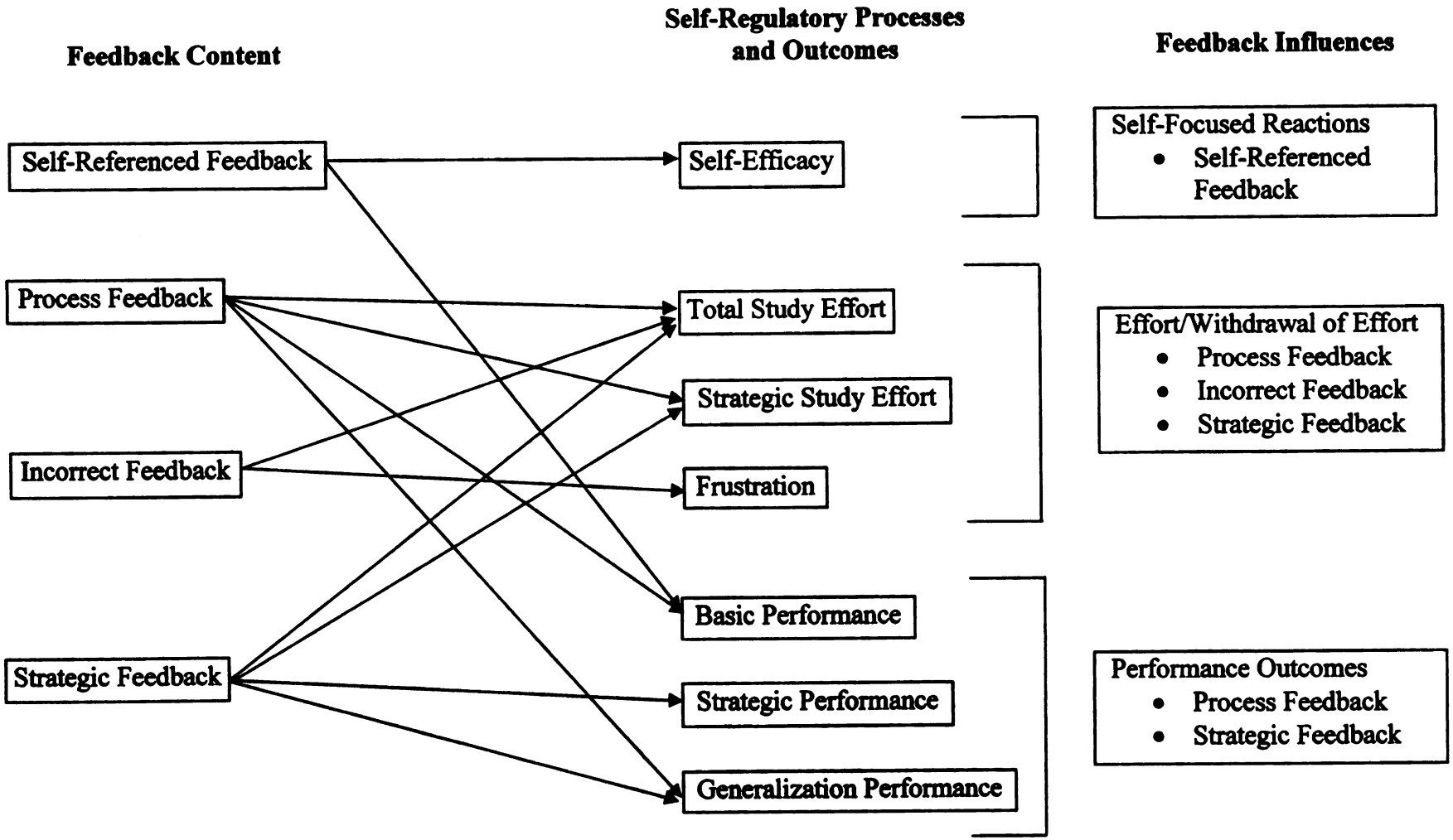


Figure 7

Relationships Between Feedback Content Sought and Self-Regulatory Processes, Effort, and Performance Outcomes



REFERENCES

Ajzen, I. (1987). Attitudes, traits, and actions: Dispositional prediction of behavior in personality and social psychology. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 20, pp. 1-63). New York: Academic Press.

Alexander, P. A., & Judy, J. E. (1988). The interaction of domain-specific and strategic knowledge in academic performance. *Review of Educational Research, 58,* 375-404.

Alliger, G. M., & Williams, K. J. (1993). Using signal-contingent experience sampling methodology to study work in the field: A discussion and illustration examining task perceptions and mood. *Personnel Psychology, 46,* 529-545.

Ames, C. (1992). Classrooms: Goals, structures, and student motivation. *Journal of Educational Psychology, 84,* 261-271.

Ames, C., & Archer, J. (1988). Achievement goals in the classroom: Students' learning strategies and motivational processes. *Journal of Educational Psychology, 80,* 260-267.

Ammons, R. B. (1956). Effects of knowledge of performance: A survey and tentative theoretical formulation. *Journal of General Psychology, 54,* 279-299.

Ashford, S. J., & Black, J. S. (1996). Proactivity during organizational entry: The role of desire for control. *Journal of Applied Psychology, 81,* 199-214.

Ashford, S. J., & Cummings, L. L. (1983). Feedback as an individual resource: Personal strategies of creating information. *Organizational Behavior and Human Decision Processes, 32,* 370-398.

Ashforth, B. E., & Lee, R. T. (1990). Defensive behavior in organizations: A preliminary model. *Human Relations, 43,* 621-648.

Atkinson, J. W. (1957). Motivational determinants of risk-taking behavior. *Psychological Review, 64,* 359-372.

Atkinson, J. W. (1964). *An introduction to motivation.* Princeton, NJ: Van Nostrand.

Bandura, A. (1982). Self-efficacy mechanism in human agency. *American Psychologist, 37,* 122-147.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory.* Englewood Cliffs, NJ: Prentice-Hall.

Bandura, A. (1989). Human agency in social cognitive theory. *American Psychologist, 44,* 1175-1184.

Bandura, A. (1991). Social cognitive theory of self-regulation. *Organizational Behavior and Human Decision Processes, 50,* 248-287.

Bandura, A. (1997). *Self-efficacy: The exercise of control.* New York: Freeman.

Bandura, A., & Cervone, D. (1983). Self-evaluative and self-efficacy mechanisms governing the motivational effects of goal systems. *Journal of Personality and Social Psychology, 45,* 1017-1028.

Bandura, A., & Cervone, D. (1986). Differential engagement of self-reactive influences in cognitive motivation. *Organizational Behavior and Human Decision Processes, 38,* 92-113.

Bandura, M., & Dweck, C. S. (1985). *The relationship of conceptions of intelligence and achievement goals to achievement-related cognition, affect and behavior.* Unpublished manuscript.

Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology, 51,* 1173-1182.

Bell, B. S. (1999). *The effects of guidance on learning and training performance in a complex training simulation.* Unpublished master's thesis, Michigan State University, East Lansing.

Bell, B. S. (2002). *An examination of the instructional, motivational, and emotional elements of error training.* Unpublished doctoral dissertation, Michigan State University, East Lansing.

Bell, B. S., & Kozlowski, S. W. J. (2002a). Adaptive guidance: Enhancing self-regulation, knowledge, and performance in technology-based training. *Personnel Psychology, 55,* 267-306.

Bell, B. S., & Kozlowski, S. W. J. (2002b). Goal orientation and ability: Interactive effects on self-efficacy, performance, and knowledge. *Journal of Applied Psychology, 87,* 497-505.

Black, J. S., & Ashford, S. J. (1995). Fitting in or making jobs fit: Factors affecting mode of adjustment for new hires. *Human Relations, 48,* 421-437.

Bobko, P., & Colella, A. (1994). Employee reactions to performance standards: A review and research propositions. *Personnel Psychology, 47,* 1-29.

Boyle, K. A., & Klimoski, R. J. (1995, April). *Toward an understanding of goal orientation in a training context.* Paper presented at the meeting of the Society for Industrial and Organizational Psychology, Orlando, FL.

Brown, A. L., Bransford, J. D., Campione, J. C., & Ferrara, R. A. (1983). Learning, remembering, and understanding. In J. Flavell & E. Markman (Eds.), *Handbook of child psychology: Vol. 3. Cognitive development.* (pp. 77-166). New York: Wiley.

Brown, K. G. (2001). Using computers to deliver training: Which employees learn and why? *Personnel Psychology, 54,* 271-296.

Butler, D. L., & Winne, P. H. (1995). Feedback and self-regulated learning: A theoretical synthesis. *Review of Educational Research, 65,* 245-281.

Butler, R. (1987). Task-involving and ego-involving properties of evaluation: Effects of different feedback conditions on motivational perceptions, interest, and performance. *Journal of Educational Psychology, 79,* 474-482.

Button, S. B., Mathieu, J. E., & Zajac, D. M. (1996). Goal orientation in organizational research: A conceptual and empirical foundation. *Organizational Behavior and Human Decision Processes, 67,* 26-48.

Carver, C. S., & Scheier, M. F. (1981). *Attention and self regulation: A control theory to human behavior.* New York: Springer-Verlag.

Carver, C. S., & Scheier, M. F. (1982). Control theory: A useful conceptual framework for personality-social, clinical, and health psychology. *Psychological Bulletin, 92,* 111-135.

Carver, C. S., & Scheier, M. F. (2000). On the structure of behavioral self-regulation. In M. Boekarts, P. R. Pintrich, & M. Zeidner (Eds.), *Handbook of self-regulation* (pp. 41-84). San Diego, CA: Academic Press.

Colquitt, J. A., & Simmering, M. J. (1998). Conscientiousness, goal orientation, and motivation to learn during the learning process: A longitudinal study. *Journal of Applied Psychology, 83,* 654-665.

Corno, L. (1986). The metacognitive control components of self-regulated learning. *Contemporary Educational Psychology, 11,* 333-346.

Corno, L., & Mandinach, E. (1983). The role of cognitive engagement in classroom learning and motivation. *Educational Psychologist, 18,* 88-100.

Corno, L., & Rohrkemper, M. (1985). The intrinsic motivation to learn in classrooms. In C. Ames & R. Ames (Eds.), *Research on motivation: Vol. 2. The classroom milieu* (pp. 53-90). New York: Academic Press.

Craik, F. I. M., & Lockhart, R. S. (1972). Levels of processing: A framework for memory research. *Journal of Verbal Learning and Verbal Behavior, 11,* 671-684.

Debowski, S., Wood, R. E., & Bandura, A. (2001). Impact of guided exploration and enactive exploration on self-regulatory mechanisms and information acquisition through electronic search. *Journal of Applied Psychology, 86,* 1129-1141.

Deci, E. L. (1975). *Intrinsic motivation.* New York: Plenum.

Deci, E. L., & Ryan, R. M. (1980). A motivational approach to self: Integration in personality. In R. Dientsbier (Ed.), *Nebraska Symposium on Motivation* (Vol. 38, pp. 237-288). Lincoln: University of Nebraska Press.

Diefendorff, J. M., Hall, R. J., Lord, R. G., & Strean, M. L. (2000). Action-state orientation: Construct validity of a revised measure and its relationship to work-related variables. *Journal of Applied Psychology, 85,* 250-263.

Dobbins, H. W. (2002). *Regulatory focus and evaluative feedback: Effects on feedback seeking, learning, and performance.* Unpublished master's thesis, Michigan State University, East Lansing.

Dweck, C. S. (1986). Motivational processes affecting learning. *American Psychologist, 41,* 1040-1048.

Dweck, C. S., & Bempechat, J. (1983). Children's theories of intelligence. In S. Paris, G. Olsen, & H. Stevenson (Eds.), *Learning and motivation in the classroom* (pp. 239-256). Hillsdale, NJ: Erlbaum.

Dweck, C. S., & Elliott, E. S. (1983). Achievement motivation. In E. M. Hetherington (Ed.), *Socialization, personality, and social development* (pp. 643-691). New York: Wiley.

Dweck, C. S., & Leggett, E. L. (1988). A social-cognitive approach to motivation and personality. *Psychological Review, 95,* 256-273.

Dweck, C. S., Tenney, Y., & Dinces, N. (1982). [Implicit theories of intelligence as determinants of achievement goal choice]. Unpublished raw data.

Earley, P. C., Connolly, T., & Ekegren, G. (1989). Goals, strategy development, and task performance: Some limits on the efficacy of goal setting. *Journal of Applied Psychology, 74,* 24-33.

Elliot, A. J. (1999). Approach and avoidance motivation and achievement goals. *Educational Psychologist, 34,* 169-189.

Elliot, A. J., & Church, M. (1997). A hierarchical model of approach and avoidance achievement motivation. *Journal of Personality and Social Psychology, 72,* 218-232.

Elliot, A. J., & Covington, M. V. (2001). Approach and avoidance motivation. *Educational Psychology Review, 13,* 73-92.

Elliot, A. J., & Harackiewicz, J. M. (1996). Approach and avoidance achievement goals and intrinsic motivation: A mediational analysis. *Journal of Personality and Social Psychology, 70,* 461-475.

Elliot, A. J., & McGregor, H. A. (2001). A 2 x 2 achievement goal framework. *Journal of Personality and Social Psychology, 80,* 501-519.

Elliot, A. J., & Thrash, T. M. (2001). Approach-avoidance motivation in personality: Approach and avoidance temperaments and goals. *Journal of Personality and Social Psychology, 82,* 804-818.

Ericsson, K. W., Krampe, R. T., & Tesch-Romer, C. (1993). The role of deliberate practice in the acquisition of expert performance. *Psychological Review, 100,* 363-406.

Farr, J. L. (1993). Informal performance feedback: Seeking and giving. In H. Schuler, J. L. Farr, & M. Smith (Eds.), *Personnel selection and assessment: Individual and organizational perspectives* (pp. 163-180). Hillsdale, NJ: Erlbaum.

Farr, J. L., Hoffman, D. A., & Ringenbach, K. L. (1993). Goal orientation and action control theory: Implications for industrial and organizational psychology. *International Review of Industrial and Organizational Psychology, 8,* 193-232.

Fisher, S. L., & Ford, J. K. (1998). Differential effects of learner effort and goal orientation on two learning outcomes. *Personnel Psychology, 51,* 397-420.

Fitts, P. M., & Posner, M. I. (1967). *Human performance.* Oxford, England: Brooks/Cole.

Flavell, J. H. (1979). Metacognition and cognitive monitoring: A new area of cognitive-developmental inquiry. *American Psychologist, 34,* 906-911.

Flett, G., Hewitt, P., Blankenstein, K., & Gray, L. (1998). Psychological distress and the frequency of perfectionistic thinking. *Journal of Personality and Social Psychology, 75,* 1363-1381.

Ford, J. K., Smith, E., Weissbein, D., Gully, S. M., & Salas, E. (1998). Relationships of goal orientation, metacognitive activity, and practice strategies with learning outcomes and transfer. *Journal of Applied Psychology, 83,* 218-233.

Gagne, R. M. (1970). *The conditions of learning* (2nd ed.). Oxford, England: Holt, Rinehart and Wilson.

Gist, M. E., & Mitchell, T. R. (1992). Self-efficacy: A theoretical analysis of its determinants and malleability. *Academy of Management Review, 17,* 183-211.

Gitomer, D. H. (1984). *A cognitive analysis of a complex troubleshooting task.* Unpublished doctoral dissertation, University of Pittsburgh, Pittsburgh.

Goldstein, I. L. (1993). *Training in organizations: Needs assessment, development, and evaluation* (3rd ed.). Monterey, CA: Brooks/Cole.

Goldstein, I. L., & Ford, J. K. (2002). *Training in organizations: Needs assessment, development, and evaluation* (4th ed.). Belmont, CA: Wadsworth.

Harris, M. J., & Rosenthal, R. (1985). Mediation of interpersonal expectancies effects: 31 meta-analyses. *Psychological Bulletin, 97,* 363-386.

Higgins, E. T. (1987). Self-discrepancy: A theory relating self and affect. *Psychological Review, 94,* 319-340.

Higgins, E. T. (1997). Beyond pleasure and pain. *American Psychologist, 52,* 1280-1300.

Hollenbeck, J. R., Klein, H. J., O'Leary, A. M., & Wright, P. M. (1989). Investigation of the construct validity of a self-report measure of goal commitment. *Journal of Applied Psychology, 74,* 951-956.

Hunter, J. E. (1986). Cognitive ability, cognitive aptitudes, job knowledge, and job performance. *Journal of Vocational Behavior, 29,* 340-362.

Hysong, S. J., & Quinones, M. A. (1997, April). *The relationship between self-efficacy and performance: A meta-analysis.* Paper presented at the meeting of the Society for Industrial and Organizational Psychology, St. Louis, MO.

James, L. R., & Brett, J. M. (1984). Mediators, moderators, and tests for mediation. *Journal of Applied Psychology, 69,* 307-321.

Kanfer, R. (1990). Motivation theory and industrial and organizational psychology. In M. D. Dunnett & L. Hough (Eds.), *Handbook of industrial and organizational psychology* (pp. 75-170). Palo Alto, CA: Consulting Psychologists Press.

Kanfer, R., & Ackerman, P. L. (1989). Motivation and cognitive abilities: An integrative/aptitude-treatment interaction approach to skill acquisition [Monograph]. *Journal of Applied Psychology, 74,* 657-690.

Kanfer, R., Ackerman, P. L., Murtha, T. C., Dugdale, B., & Nelson, L. (1994). Goal setting, conditions of practice, and task performance: A resource allocation perspective. *Journal of Applied Psychology, 79,* 826-835.

Karoly, P. (1993). Mechanisms of self-regulation: A systems view. *Annual Review of Psychology, 44,* 23-52.

Kluger, A. N., & DeNisi, A. (1996). The effects of feedback interventions on performance: A historical review, a meta-analysis, and a preliminary feedback intervention theory. *Psychological Bulletin, 119,* 254-284.

Kozlowski, S. W. J., & Bell, B. S. (2003). Work groups and teams in organizations. In W. C. Borman, D. R. Ilgen, & R. J. Klimoski (Eds.), *Comprehensive handbook of psychology (Vol. 12): Industrial and organizational psychology.* New York: Wiley.

Kozlowski, S. W. J., & DeShon, R. P. (in press). A psychological fidelity approach to simulation-based training: Theory, research, and principles. In E. Salas, L. R. Elliott, S. G. Schflett, & M. D. Coovert (Eds.), *Scaled worlds: Development, validation, and applications.* Burlington, VT: Ashgate Publishing.

Kozlowski, S. W. J., & Gully, S. M. (1996, August). TEAMS/TANDEM: Examining skill acquisition, adaptability, and effectiveness. In J. Vancouver & A. Williams (Chairs), *Using computer simulations to study complex organizational behavior.* Symposium conducted at the meeting of the Academy of Management, Cincinnati, OH.

Kozlowski, S. W. J., Gully, S. M., Brown, K. G., Salas, E., Smith, E. M., & Nason, E. R. (2001). Effects of training goals and goal orientation traits on multidimensional training outcomes and performance adaptability. *Organizational Behavior and Human Decision Processes, 85,* 1-31.

Kozlowski, S. W. J., Gully, S. M., Smith, E. M., Brown, K. G., Mullins, M. E., & Williams, A. E. (1996, April). Sequenced mastery goals and advance organizers: Enhancing the effects of practice. In K. Smith-Jentsch (Chair), *When, how, and why does practice make perfect?* Symposium conducted at the meeting of the Society for Industrial and Organizational Psychology, San Diego, CA.

Kozlowski, S. W. J., Toney, R. J., Mullins, M. E., Weissbein, D. A., Brown, K. G., & Bell, B. S. (2001). Developing adaptability: A theory for the design of integrated-embedded training systems. In E. Salas (Ed.), *Advances in human performance and cognitive engineering research* (Vol. 1., pp. 59-123). Ukraine: JAI Press.

Kozlowski, S. W. J., Toney, R. J., Weissbein, D. A., Mullins, M. E., Brown, K. G., & Bell, B. S. (1998, April). Training adaptive performance. In S. W. J. Kozlowski, S. K. Parker, & M. Frese (Chairs), *Beyond task performance: Proactivity and learning.* Symposium conducted at the meeting of the Society for Industrial and Organizational Psychology, Dallas, TX.

Kozlowski, S. W. J., Weissbein, D. A., Brown, K. G., Toney, R. J., & Mullins, M. (1997). *Guiding the development of deployable shipboard training systems: Enhancing skill acquisition, adaptability, and effectiveness.* (Final Report 1.1; Contract No. N61339-96-K-0005). Orlando, FL: Naval Air Warfare Center Training Systems Division.

Kraiger, K., Ford, J. K., and Salas, E. (1993). Application of cognitive, skill-based, and affective theories of learning outcomes to new methods of training evaluation [Monograph]. *Journal of Applied Psychology, 78,* 311-328.

Kruglanski, A. W., Thompson, E. P., Higgins, E. T., Atash, M. N., Pierro, A., Shah, J. Y., et al. (2000). To "do the right thing" or to "just do it": Locomotion and assessment as distinct self-regulatory imperatives. *Journal of Personality and Social Psychology, 79,* 793-815.

Kukla, A. (1978). An attributional theory of choice. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 11, pp. 113-144). New York: Academic Press.

Larsen, R. J., & Diener, E. (1987). Affect intensity as an individual difference characteristic: A review. *Journal of Research in Personality, 21,* 1-39.

Latham, G. P., & Locke, E. A. (1991). Self-regulation through goal setting. *Organizational Behavior and Human Decision Processes, 50,* 212-247.

Lee, C., & Bobko, P. (1994). Self-efficacy beliefs: Comparison of five measures. *Journal of Applied Psychology, 79,* 364-369.

Leggett, E. L. (1985, March). *Children's entity and incremental theories of intelligence: Relationships to achievement behavior.* Paper presented at the meeting of the Eastern Psychological Association, Boston.

Levy, P. E., Albright, M. D., Cawley, B. D., & Williams, J. R. (1995). Situational and individual determinants of feedback seeking: A closer look at the process. *Organizational Behavior and Human Decision Processes, 62,* 23-37.

Lewin, K., Dembo, T., Festinger, L., & Sears, P. S. (1944). Level of aspiration. In J. McHunt (Ed.), *Personality and the behavior disorders* (Vol. 1, pp. 333-378). New York: Ronald Press.

Locke, E. A. (1967). Motivational effects of knowledge of results: Knowledge or goal settings? *Journal of Applied Psychology, 51,* 324-329.

Locke, E. A., & Bryan, J. F. (1969). Knowledge of scores and goal level as determinants of work rate. *Journal of Applied Psychology, 53,* 59-65.

Locke, E. A., & Latham, G. P. (1990). *A theory of goal setting and task performance.* Englewood Cliffs, NJ: Prentice-Hall.

Losco, J., & Epstein, S. (1977). Relative steepness of approach and avoidance gradients as a function of magnitude and valence of incentive. *Journal of Abnormal Psychology, 86,* 360-368.

Maier, G. W., & Brunstein, J. C. (2001). The role of personal work goals in newcomers' job satisfaction and organizational commitment: A longitudinal analysis. *Journal of Applied Psychology, 86,* 1034-1042.

Martocchio, J. J. (1994). Effects of conceptions of ability on anxiety, self-efficacy, and learning in training. *Journal of Applied Psychology, 79,* 3-14.

McClelland, D. C. (1951). Measuring motivation in phantasy: The achievement motive. In H. Guetzkow (Ed.), *Grouops, leadership, and psychology* (Vol. 2, pp. 191-205). Pittsburgh, PA: Carnegie Press.

McFarland, C., & Ross, M. (1982). Impact of causal attributions on affective reactions to success and failure. *Journal of Personality and Social Psychology, 43,* 937-946.

Meece, J. L., Blumenfeld, P. C., & Hoyle, R. H. (1988). Students' goal orientations and cognitive engagement in classroom activities. *Journal of Educational Psychology, 80,* 514-523.

Middleton, M., & Midgley, C. (1997). Avoiding the demonstration of lack of ability: An underexplored aspect of goal theory. *Journal of Educational Psychology, 89,* 710-718.

Midgley, C., Kaplan, A., Middleton, M., Maehr, M. L., Urdan, T., Anderman, L. et al. (1998). The development and validation of scales assessing students' achievement goal orientations. *Contemporary Educational Psychology, 23,* 113-131.

Milheim, W. D., & Martin, B. L. (1991). Theoretical bases for the use of learner control: Three different perspectives. *Journal of Computer Based Instruction, 18,* 99-105.

Murphy, K. R., & Myors, B. (1998). *Statistical power analysis: A simple and general model for traditional and modern hypothesis tests.* Mahwah, NJ: Erlbaum.

Murray, H. (1938). *Explorations in personality.* New York: Oxford University Press.

Nicholls, J. G. (1984). Achievement motivation: Conceptions of ability, subjective experience, task choice, and performance. *Psychological Review, 91,* 328-346.

Nicholls, J. G. (1989). *The competitive ethos and democratic education.* Cambridge, MA: Harvard University Press.

Nicholls, J. G., & Dweck, C. S. (1979). *A definition of achievement motivation.* Unpublished manuscript, University of Illinois.

Noe, R., & Schmitt, N. (1986). The influence of trainee attitudes on training effectiveness: Test of a model. *Personnel Psychology, 39,* 497-523.

Nolen, S. B. (1988). Reasons for studying: Motivational orientations and study strategies. *Cognition and Instruction, 5,* 269-287.

Paris, S. G., Lipson, M. Y., & Wixson, K. (1983). Becoming a strategic reader. *Contemporary Educational Psychology, 8,* 293-316.

Phillips, J. M., & Gully, S. M. (1997). Role of goal orientation, ability, need for achievement, and locus of control in the self-efficacy and goal-setting process. *Journal of Applied Psychology, 82,* 792-802.

Pintrich, P. R. (1988). A process-oriented view of student motivation and cognition in the college classroom. In J. S. Stark & L. Mets (Eds.), *Improving teaching and learning through research. New directions for institutional research, 57* (pp. 55-70). San Francisco: Jossey-Bass.

Pintrich, P. R. (1989). The dynamic interplay of student motivation and cognition. In C. Ames & M. Maehr (Eds.), *Advances in motivation and achievement: Motivation enhancing environments* (Vol. 6, pp. 117-160). Greenwich, CT: JAI Press.

Pintrich, P. R. (2000). The role of goal orientation in self-regulated learning. In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), *Handbook of self-regulation* (pp. 451-502). San Diego, CA: Academic Press.

Pintrich, P. R., Cross, D. R., Kozma, R. B., & McKeachie, W. J. (1986). Instructional psychology. *Annual Review of Psychology, 37,* 611-651.

Pintrich, P. R., & De Groot, E. V. (1990). Motivational and self-regulated learning components of classroom academic performance. *Journal of Educational Psychology, 82,* 33-40.

Pintrich, P. R., & Garcia, T. (1991). Student goal orientation and self-regulation in the college classroom. In M. L. Maehr & P. R. Pintrich (Eds.), *Advances in motivation and achievement: Goals and self-regulatory processes* (Vol. 7, pp. 371-402). Greenwich, CT: JAI Press.

Ryan, R. M., & Grolnick, W. S. (1986). Origins and pawns in the classroom: Self-report and projective assessments of individual differences in children's perceptions. *Journal of Personality and Social Psychology, 50,* 550-558.

Schmidt, F. L. (1988). The problem of group differences in ability test scores in employment selection. *Journal of Vocational Behavior, 33,* 272-292.

Schunk, D. H. (1990). Goal setting and self-efficacy during self-regulated learning. *Educational Psychologist, 25,* 71-86.

Schunk, D. H., & Ertmer, P. A. (2000). Self-regulation and academic learning. In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), *Handbook of self-regulation* (pp. 631-649). San Diego, CA: Academic Press.

Simon, H. A., & Chase, W. G. (1973). Skill in chess. *American Psychologist, 61,* 394-403.

Smith, M. U., & Good, R. (1984). Problem solving and classical genetics: Successful versus unsuccessful performance. *Journal of Research in Science Teaching, 21,* 895-912.

Spivack, G., Platt, J. J., & Shure, M. B. (1976). *The problem-solving approach to adjustment.* San Francisco, CA: Jossey-Bass.

Steinberg, E. R. (1977). Review of student control in computer-assisted instruction. *Journal of Computer Based Instruction, 3,* 84-90.

Steinberg, E. R. (1989). Cognition and learner control: A literature review, 1977-1988. *Journal of Computer Based Instruction, 16,* 117-121.

Tannenbaum, S. I., Mathieu, J. E., Salas, E., & Cannon-Bowers, J. A. (1991). Meeting trainees' expectations: The influence of training fulfillment on the development of commitment, self-efficacy, and motivation. *Journal of Applied Psychology, 76,* 759-769.

Tennyson, C. L., Tennyson, R. D., & Rothen, W. (1980). Content structure and instructional control strategies as design variables in concept acquisition. *Journal of Educational Psychology, 72,* 499-505.

Tennyson, R. D. (1980). Instructional control strategies and content structure as design variables in concept acquisition using computer-based instruction. *Journal of Educational Psychology, 72,* 525-532.

Thorndike, E. L. (1913). *Educational psychology: Vol. 2. The psychology of learning.* New York: Teachers College Press.

VandeWalle, D. (1997). Development and validation of a work domain goal orientation instrument. *Educational and Psychological Measurement, 57,* 995-1015.

VandeWalle, D., Cron, W. L., & Slocum, J. W. (2001). The role of goal orientation following performance feedback. *Journal of Applied Psychology, 86,* 629-640.

VandeWalle, D., & Cummings, L. L. (1997). A test of the influence of goal orientation on the feedback-seeking process. *Journal of Applied Psychology, 82,* 390-400.

VandeWalle, D., Ganesan, S., Challagalla, G. N., & Brown, S. P. (2000). An integrated model of feedback-seeking behavior: Disposition, context, and cognition. *Journal of Applied Psychology, 85,* 996-1003.

Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology, 54,* 1063-1070.

Weaver, J. L., Bowers, C. A., Salas, E., & Cannon-Bowers, J. A. (1995). Networked simulations: New paradigms for team performance research. *Behavioral Research Methods, Instruments, & Computers, 27,* 12-24.

Weaver, J. L., Morgan, B. B., Jr., Hall, J., & Compton, D. (1993). *Team decision making in the command information center: Development of a low-fidelity team decision making task for assessing the effects of teamwork stressors.* Orlando, FL: Naval Training Systems Center, Human Factors Division.

Weiner, N. (1948). *Cybernetics.* New York: Wiley.

Williams, K. J., Donovan, J. J., & Dodge, T. L. (2000). Self-regulation of performance: Goal establishment and goal revision processes in athletes. *Human Performance, 13,* 159-180.

Winne, P. H. (1996). A metacognitive view of individual differences in self-regulated learning. *Learning and Individual Differences, 8,* 327-353.

Winne, P. H., & Perry, N. E. (2000). Measuring self-regulated learning. In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), *Handbook of self-regulation* (pp. 531-566). San Diego, CA: Academic Press.

Zimmerman, B. J. (1986). Becoming a self-regulated learner: What are the key subprocesses? *Contemporary Educational Psychology, 11,* 307-313.

Zimmerman, B., & Pons, M. (1986). Development of a structured interview for assessing student use of self-regulated learning strategies. *American Educational Research Journal, 23,* 614-628.

Zimmerman, B., & Pons, M. (1988). Construct validation of a strategy model of student self-regulated learning. *Journal of Educational Psychology, 80,* 284-290.